DECEMBER, 1953—SIXTIETH YEAR

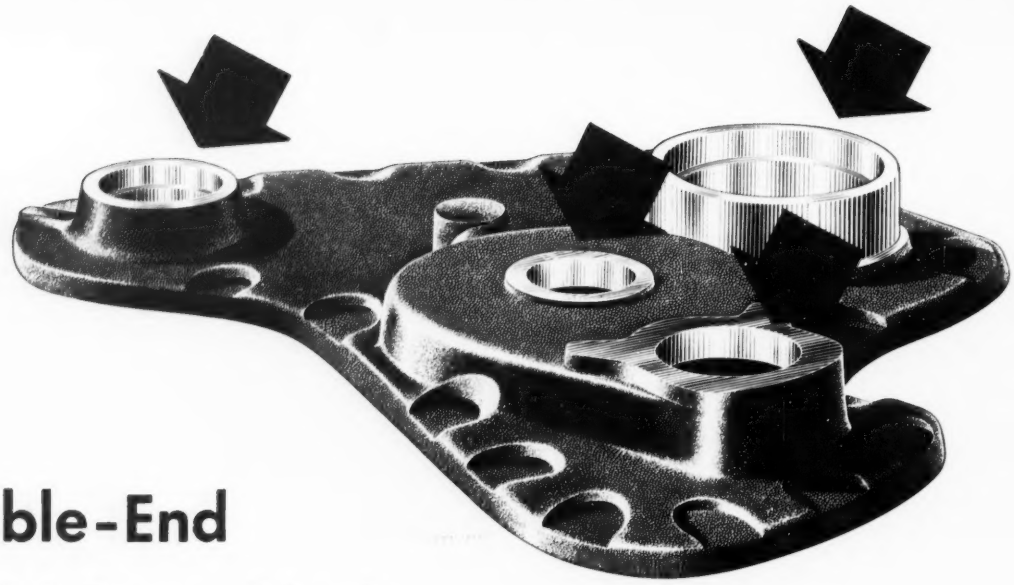
MACHINERY

"Indispensable for Production when Extreme Accuracy is required"



HARDINGE MODEL HCT, HIGH SPEED
PRECISION CHUCKING MACHINE

Finishes diameters, recesses, shoulders, back faces, front faces, and cuts precision threads in one setting—all concentric with each other. See Hardinge advertisement page 152.

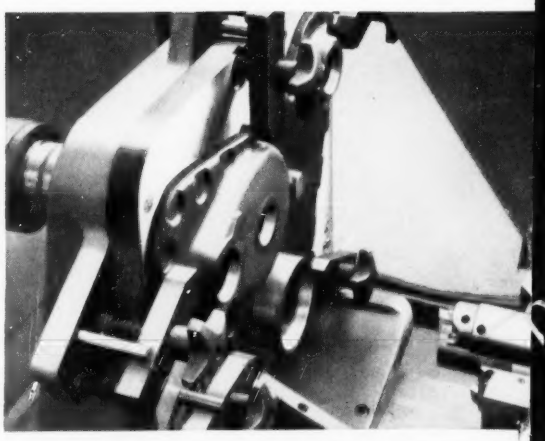


Double-End Heald Bore-Matic does a 5-HOUR JOB in 12 MINUTES

● Precision finishing the four bearing holes in this gear case cover used to be a 5-hour job — requiring separate operations on different machines. But now it's done in *12 minutes flat* — on a single Heald Model 322 Bore-Matic. That's a saving of 4 hours and 48 minutes per part!

All operations, including boring, facing, chamfering and turning, are performed at a single loading, in one high-speed automatic cycle. Four boringheads are used — one on the left-hand bridge and three on the right. The work is automatically presented to the two sets of heads in sequence, after which it returns to center for reloading.

Remember — when it comes to precision finishing, it pays to come to Heald.



Internal and Rotary Surface Grinding Machines and Bore-Matics

HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

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MACHINERY

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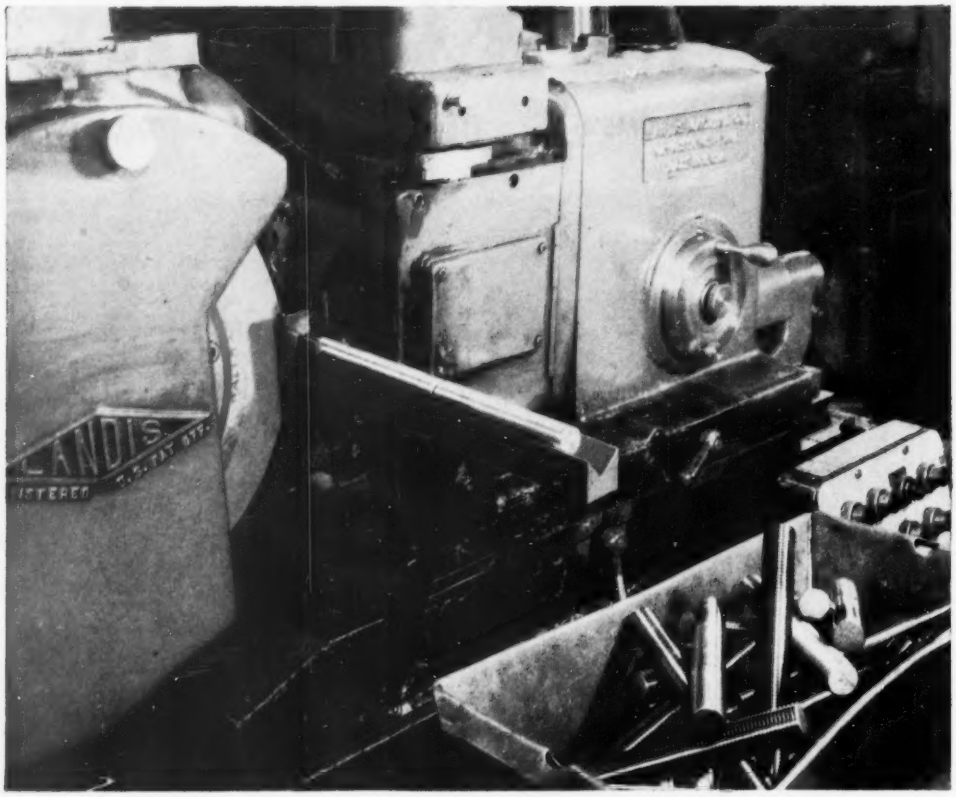
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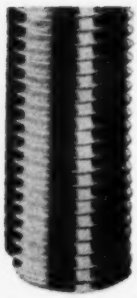
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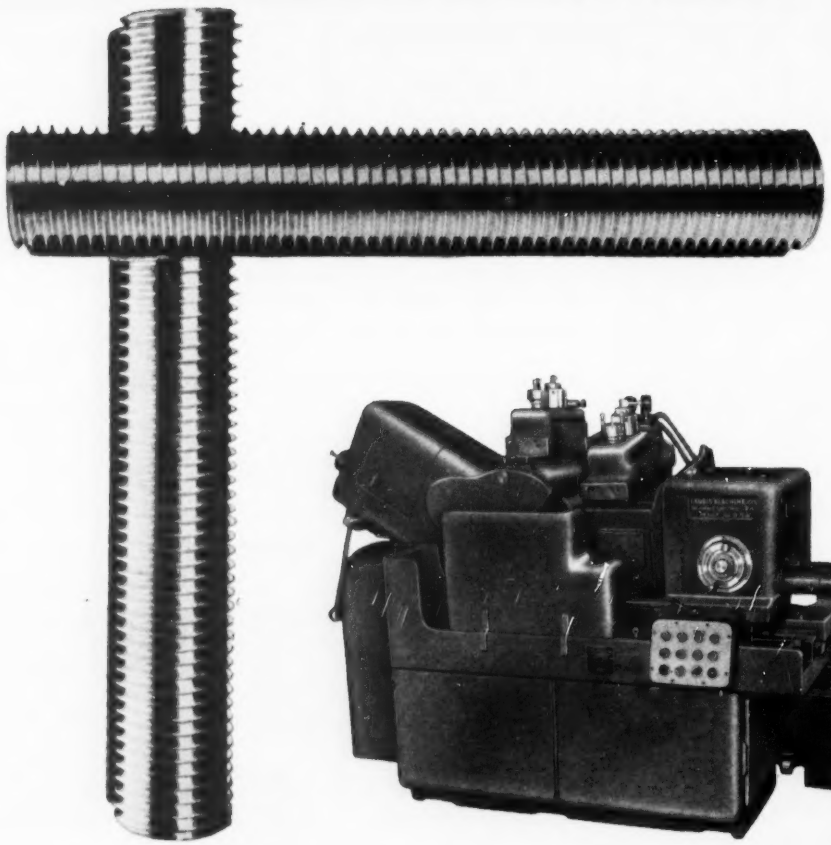
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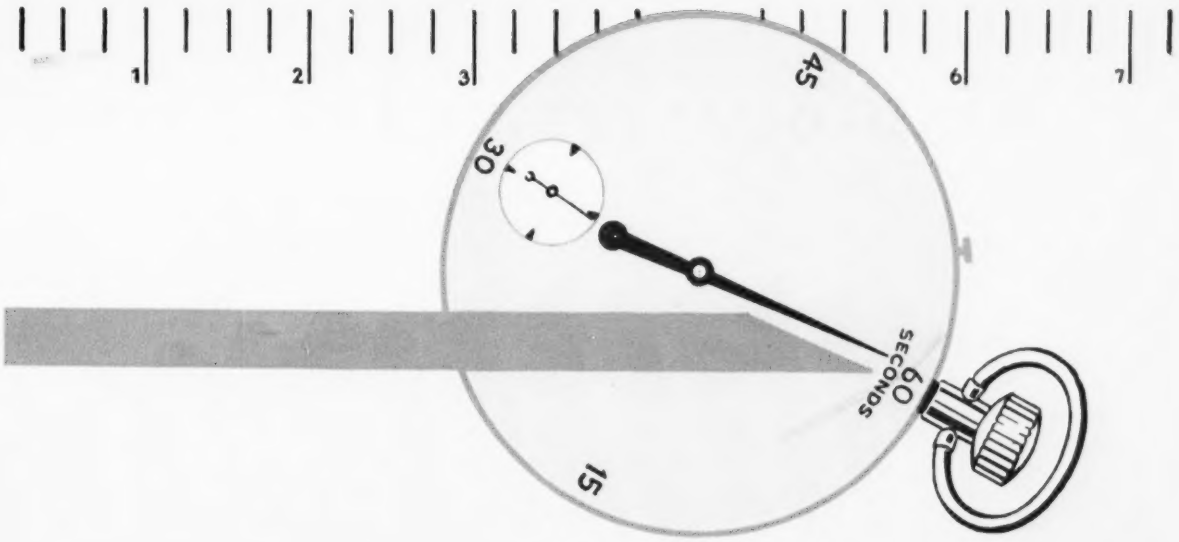
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389-C



Threads 7¼" per Minute by CONTINUOUS GRINDING

LANDIS Centerless Thread Grinders are being used at the Kilbourn Engineering Company in Milwaukee, Wisconsin, to produce continuous threaded studs for high-pressure high-temperature service.

Studs ranging from 5/8" to 1 3/8" in diameter are threaded from blanks of SAE 4140 steel heat-treated to a 260-320 Brinell hardness. In the operations illustrated, 1 1/8" 8 pitch UN threads must be generated 10" long to a Class 7 fit to meet ASA standards (Manual B1.4). These threads are produced with LANDIS #1 Centerless Thread Grinders by continuous thru-feed grinding at the rate of 7¼ linear inches per minute, **or better.** The excellent quality and smooth finish of the ground thread has reduced final assembly time and minimized galling.

Centerless Thread Grinders, manufactured exclusively by LANDIS, are designed for the high-speed threading of a wide variety of workpieces from 1/16" to 4¾" in diameter. Blanks having one or more diameters, requiring threads on the outer diameter, can be threaded automatically by the thru-feed process used here.

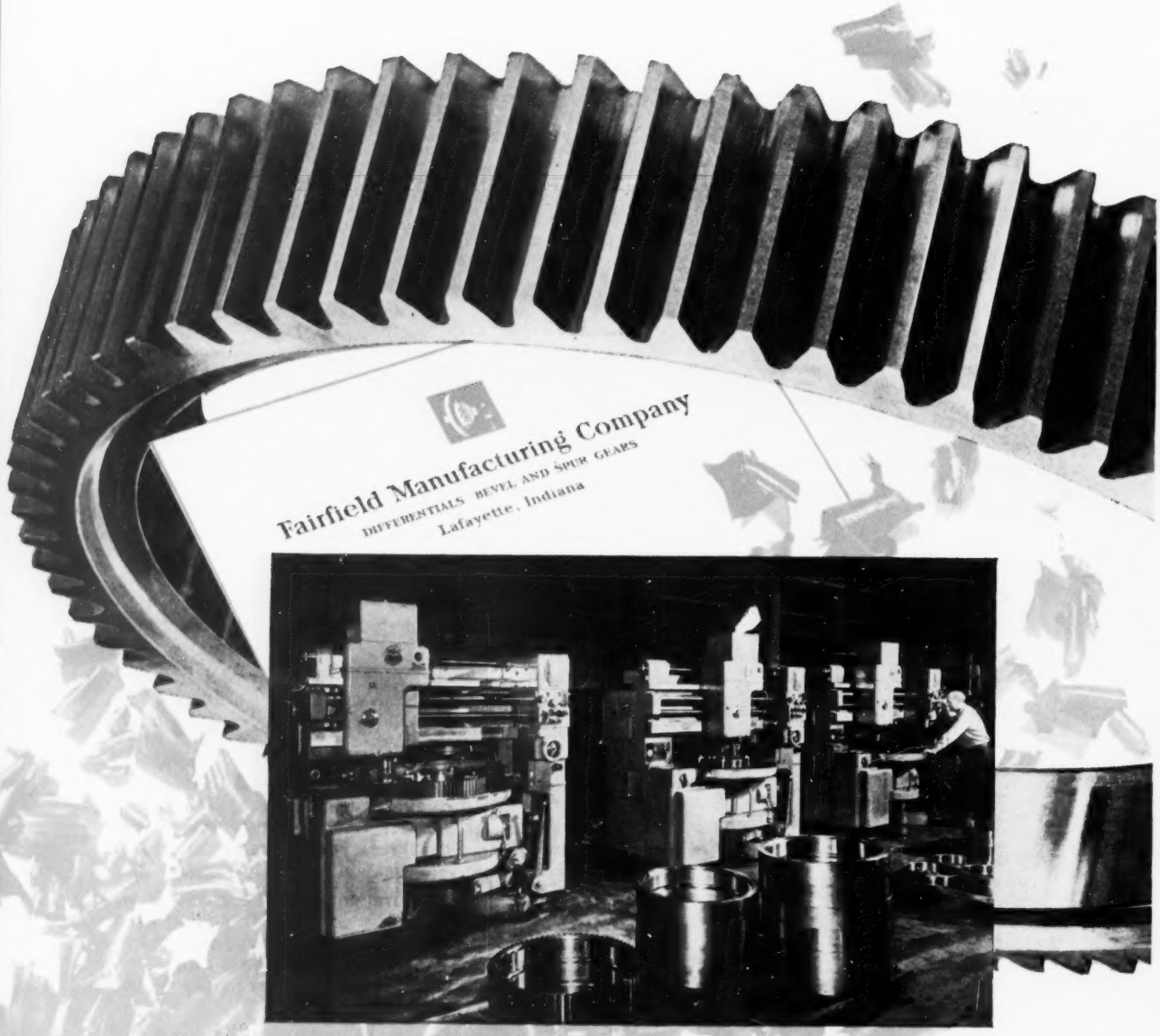
Centerless Thread Grinding, by utilizing the "up-grinding" technique, is also well-adapted for threading workpieces of high hardness and coarse pitch. This process allows up to 30% higher work surface speeds, and often eliminates secondary threading passes required by other methods. For further information, send specifications and ask for Bulletin E-97.

50TH ANNIVERSARY

LANDIS *Machine* CO. WAYNESBORO PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

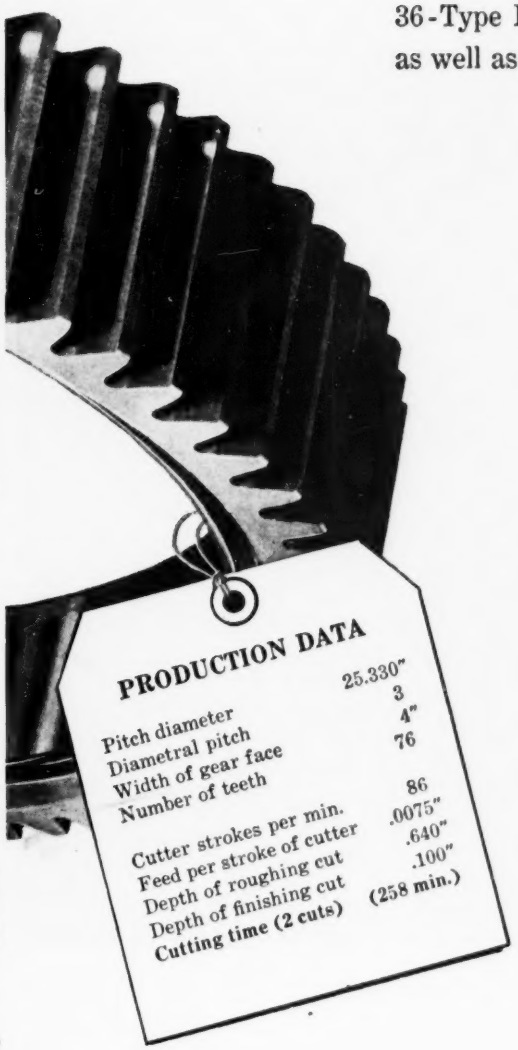
HIGH-QUALITY GEARS . . . *and* 93



Fellows

cubic inches of

STOCK REMOVAL



QUALITY gear jobs of broad variety gravitate to the 36-Type Fellows Gear Shaper — out in the Hoosier State as well as in others east, west, north and south.

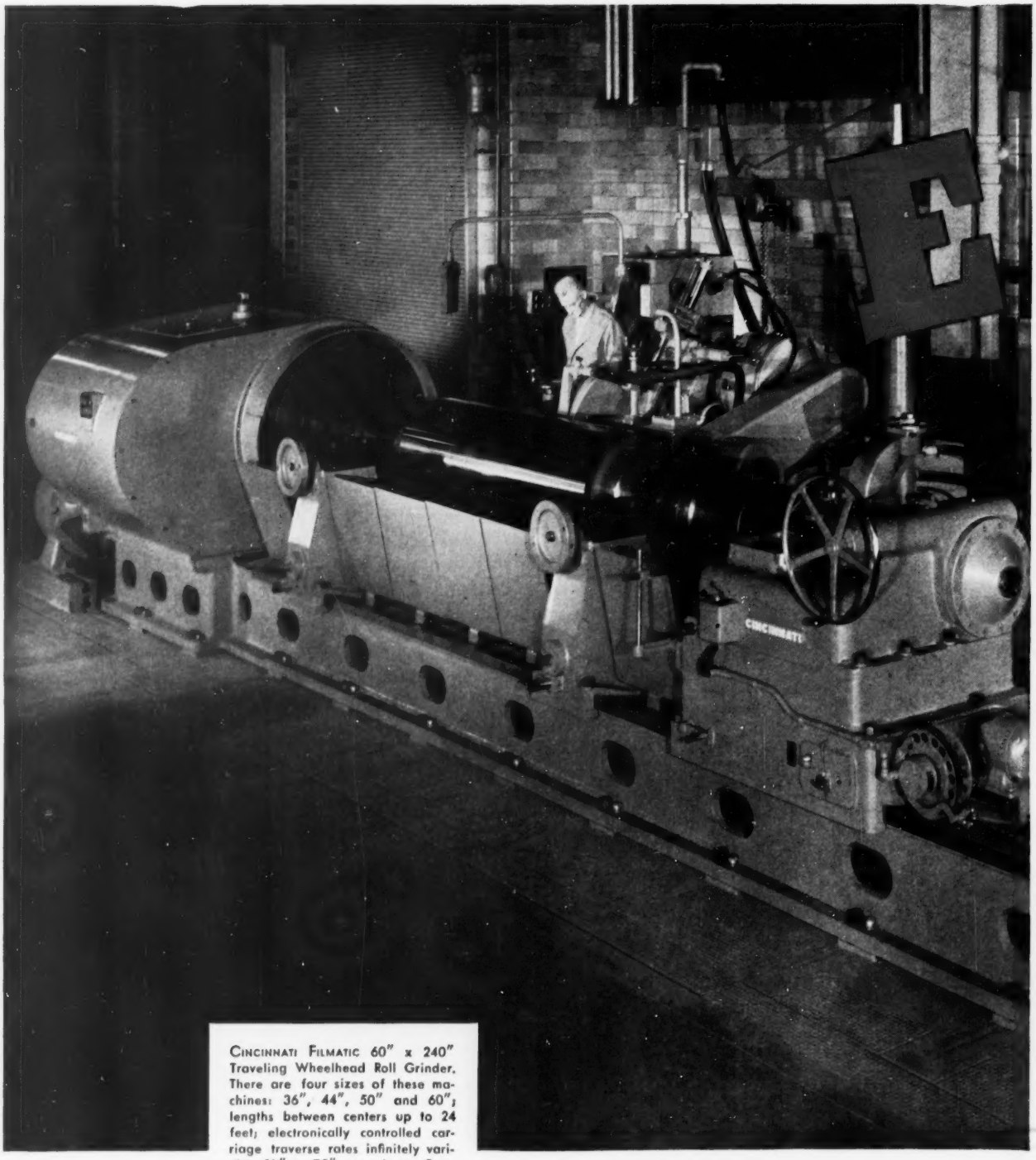
It is our good fortune to be able to picture three 36's in the Fairfield Manufacturing Company's line-up of 26 Fellows machines in their plant at Lafayette, Indiana. With them, precision and controlled costs are paramount considerations, a fact well understood and appreciated by Fairfield's wide spread of customers.

As typical of the fine work-planning (and machine performance) we give you the following report-in-detail about the heavy-duty gear being cut on the Gear Shaper nearest the camera. The gear is finished from the solid in two cuts, without a subsequent shaving operation. The blank weighs 156 pounds, and is of 4620 SAE steel. Roughing and finishing is done at the same setup, with the same Fellows cutter. Ninety-three cubic inches or 26 pounds of stock are removed—to produce fine-finish, high-quality gears.

If you aim to put quality into fine or coarse pitch gears, of dimensions best handled on a heavy-duty machine (this includes big coarse-pitch pinions, naturally), the Fellows "36" is something to investigate. » Speeds and feeds quickly adjustable via shift-lever settings. Cutter stroke variable up to 6 inches. Mass rigidity throughout invites fast, heavy cuts. » The nearest Fellows office is your point of contact. Informative literature is available.

GEAR SHAPER COMPANY

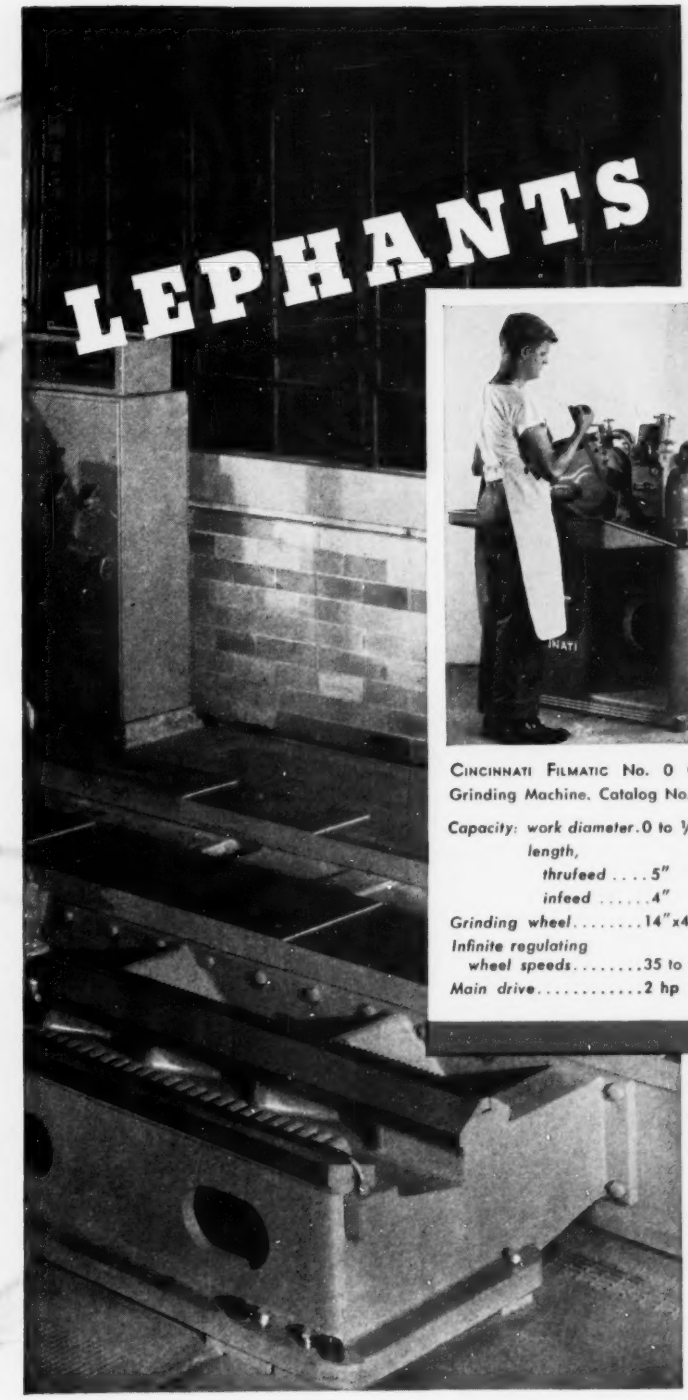
Head Office & Export Department: 78 River Street, Springfield, Vermont.
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2206 Empire State Building, New York 1.



CINCINNATI FILMATIC 60" x 240" Traveling Wheelhead Roll Grinder. There are four sizes of these machines: 36", 44", 50" and 60"; lengths between centers up to 24 feet; electronically controlled carriage traverse rates infinitely variable ¾" to 75" per minute. Complete details on request.

FILMATIC

CINCIN



CINCINNATI

LEPHANTS and Rabbits

CINCINNATI FILMATIC No. 0 Centerless Grinding Machine. Catalog No. G-576-2.

Capacity: work diameter. 0 to ½"
length, thrufeed . . . . 5"
infeed . . . . . 4"
Grinding wheel . . . . . 14"x4"x5" hole
Infinite regulating wheel speeds . . . . . 35 to 320 rpm
Main drive . . . . . 2 hp

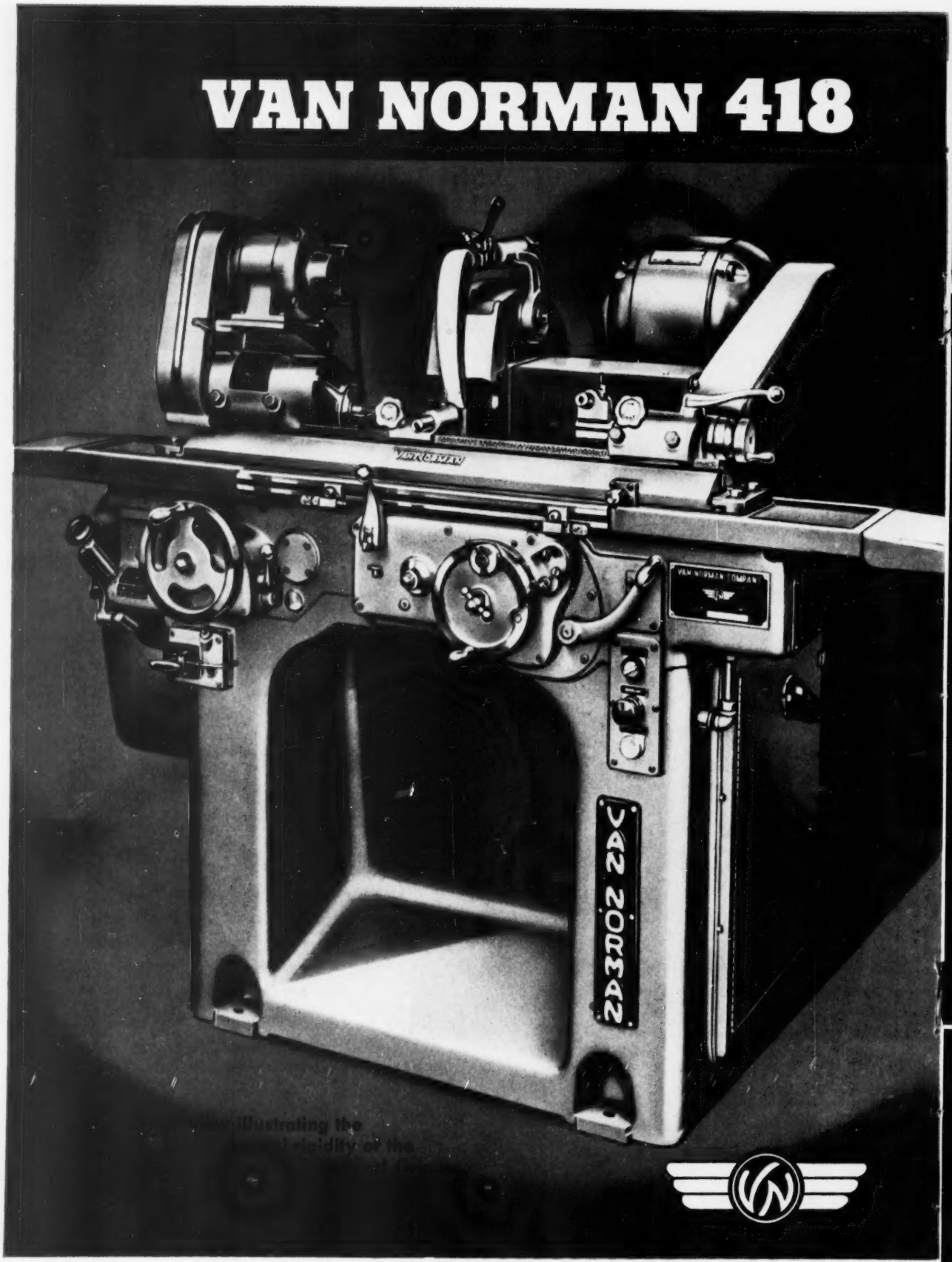
of precision grinding machines bear a familiar name plate

It takes long experience and extensive design and research facilities to build the elephants and rabbits of precision grinding. Cincinnati Grinders Incorporated have been doing it for over 25 years . . . they have the background and facilities for this type of work. Two examples of CINCINNATI FILMATIC Grinding Machines are illustrated here, a 60" x 240" Traveling Wheelhead Roll Grinder, weighing 149,500 pounds . . . about 45 times the weight of the No. 0 Centerless Grinder. Products ground by CINCINNATI FILMATIC centertype and centerless grinding machines range from surgical sutures .004" diameter, to steel rolls 60" diameter . . . 15,000 times as large and 665,000,000 times as heavy. Our engineering and shop facilities are at your service to equip your shop with any type of centertype, centerless, or special grinding machine for the lowest cost of production.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO
(Subsidiary of The Cincinnati Milling Machine Co.)

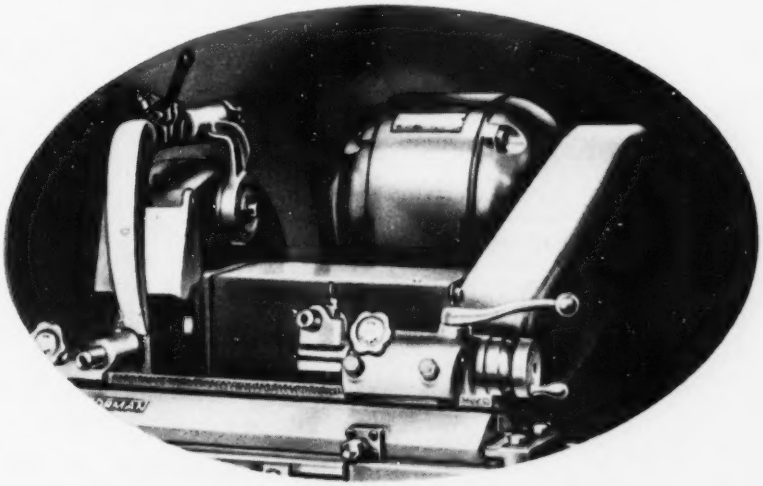
NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES


VAN NORMAN 418
VAN NORMAN COMPANY

CYLINDRICAL GRINDER

Engineered for Fast, Economical "Close-Tolerance" Plunge or Traverse Grinding of Small Parts



Grinding unit designed for maximum accuracy and long life. Pope wheel spindle equipped with heavy-duty, extra-large SKF double-row cylindrical roller bearings, assures smooth chatter-free finish.

The Van Norman 418 Cylindrical Grinder is completely engineered from base to bearings to give heavy machine performance. It is particularly adaptable for economical grinding in toolrooms, job shops or plants where work is usually in small or medium runs. Controls are conveniently grouped for ease of operation.

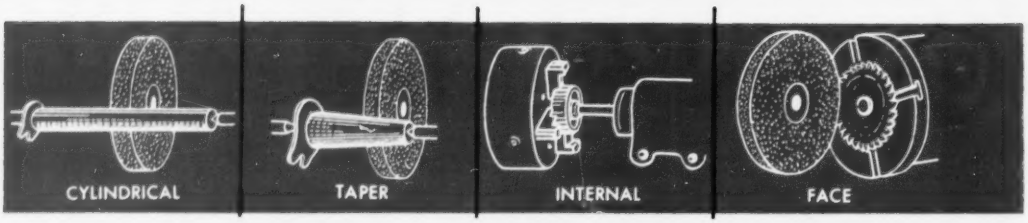
Write for bulletin giving complete details. Especially inquire about the price. It's exceptionally low for a quality grinder.

OTHER VAN NORMAN FEATURES

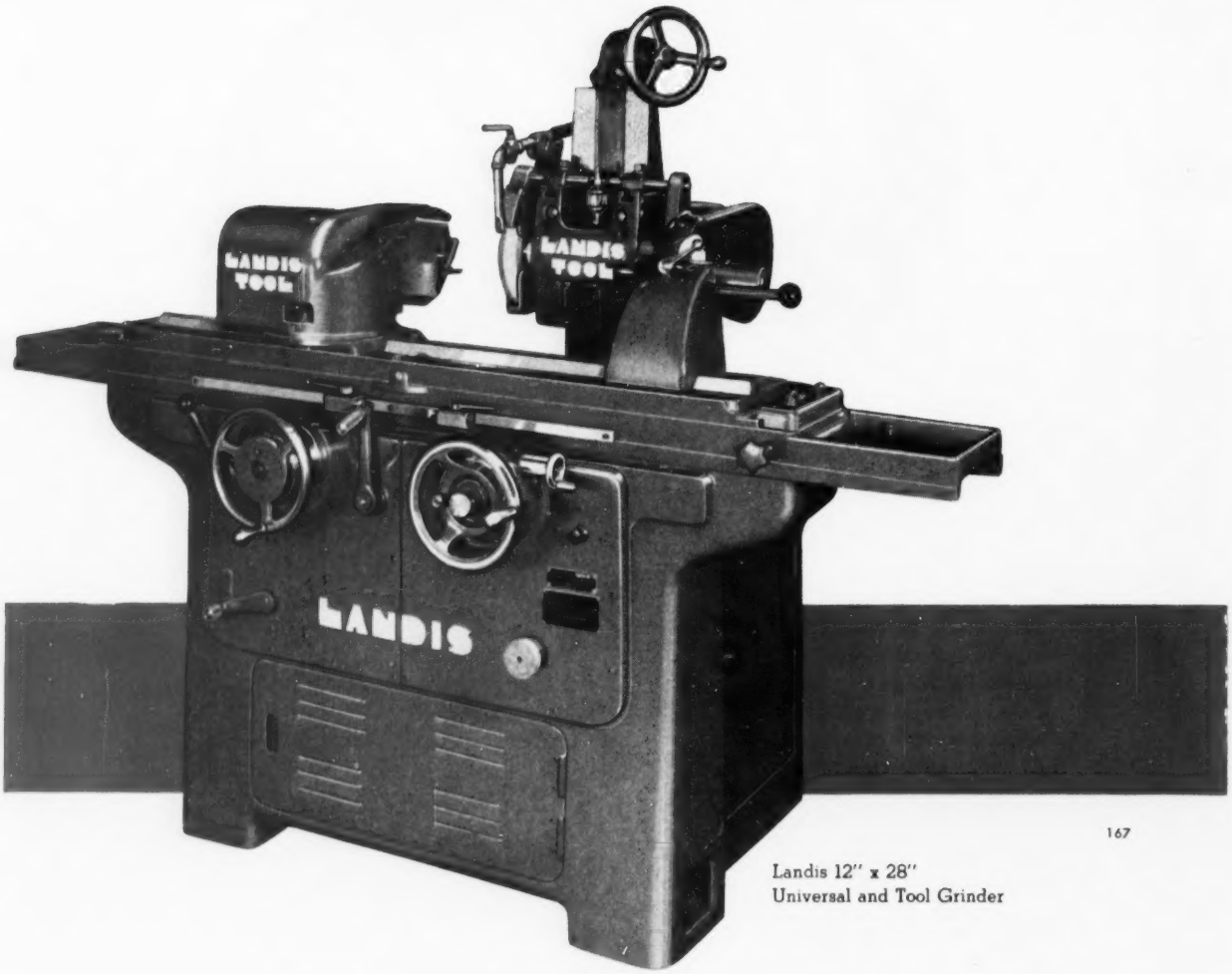
- Heavy-duty headstock and footstock for rigidity, accuracy and smooth grinding
- Single lever control for rapid traverse and plunge grinding
- Automatic starting and stopping of headstock and table traverse
- Rugged base, wide table bearing ways, separate motor drives for wheel spindle, table and headstock
- Floor space needed, only 43½" x 79¼"

VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

Your Best Buy in Small Grinders



A Universal Grinder +



167

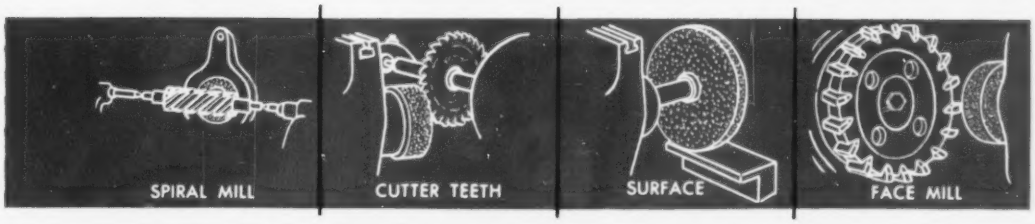
Landis 12" x 28"
Universal and Tool Grinder

LANDIS

precision grinders

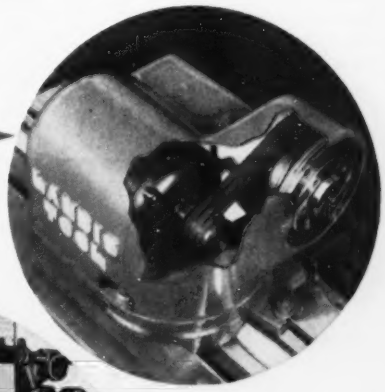
Write for Catalog K-53 for full information on the 24 different grinding operations that can be performed on this versatile machine both as a universal grinder and as a tool grinder. In includes specifications and features of this machine together with setup pictures of typical grinding operations.

2 machines in one—at low capital investment



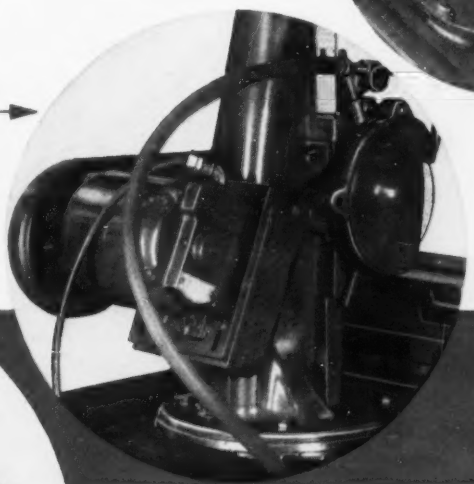
A Tool Grinder

You really get two machines in one with the Landis 12" x 28" Universal & Tool—an ideal one machine grinding department for the tool room or small shop at a big saving in capital investment over separate machines.



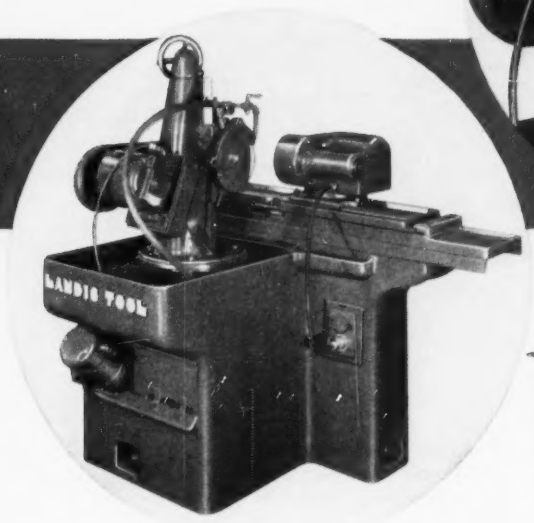
COMPACT ALL VEE-BELT HEADSTOCK

Low compact headstock particularly good for face grinding operations. All Vee-belt drive assures smooth power and fine finishes. Only two revolving parts; the electric motor and face plate or spindle.



RIGID MOTOR MOUNTING ON MASSIVE COLUMN

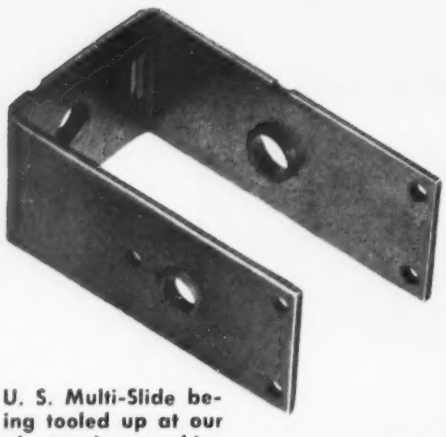
The motor is adjustable for changing belt tension. Column made with heavy sections, well ribbed. Vertical ways protected under wheel head by telescoping guides.



SPECIALLY DESIGNED FOR WET OR DRY GRINDING

The coolant tank and drain troughs are integral parts of the bed casting. All operating mechanisms are thoroughly protected to eliminate abrasive material resulting from dry grinding operations.

LANDIS TOOL COMPANY / WAYNESBORO, PENNA., U.S.A.



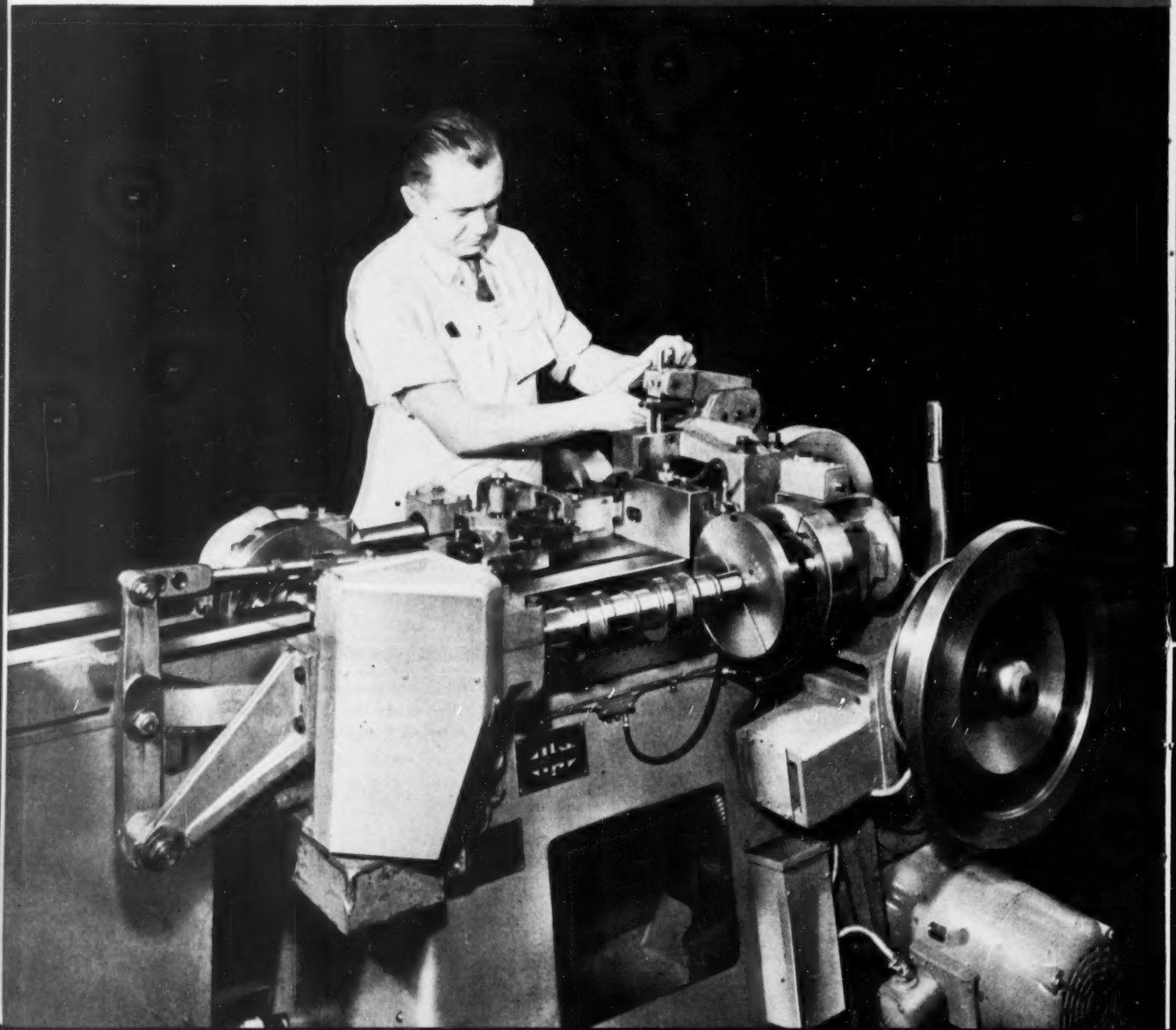






U. S. Multi-Slide being tooled up at our plant prior to shipment. U. S. Multi-Slide Machines, when sold with tooling, are tested in actual production on your part and with your stock before being shipped.

YOU CAN







Top of the bed of a No. 28 U. S. Multi-Slide Machine, with the operator making adjustments to the stock guides. Forming slides and vertical stripper movement, standard equipment on the machine, are shown at right in the photo.



PRODUCE PARTS LIKE THESE ON THE U. S. MULTI-SLIDE®





All the parts shown above and on the facing page were tooled for production in U. S. Multi-Slide® Machines by the General Tool and Engineering Company, Dayton, Ohio. They illustrate just a few of the many different types of parts which can be produced complete in the U. S. Multi-Slide — without secondary handlings and at profitable high production rates.

The feed unit, ram, forming slides and vertical stripper (which are included as standard equipment) make it possible to produce complete parts of complicated nature to close tolerances at each stroke of the machine. The U. S. Multi-Slide may be tooled up to perform trimming, piercing, shearing, embossing, swaging and forming operations in a great variety of combinations.

You, too, can reduce labor costs, increase production and improve quality by using U. S. Multi-Slides for the production of your precision formed stampings.

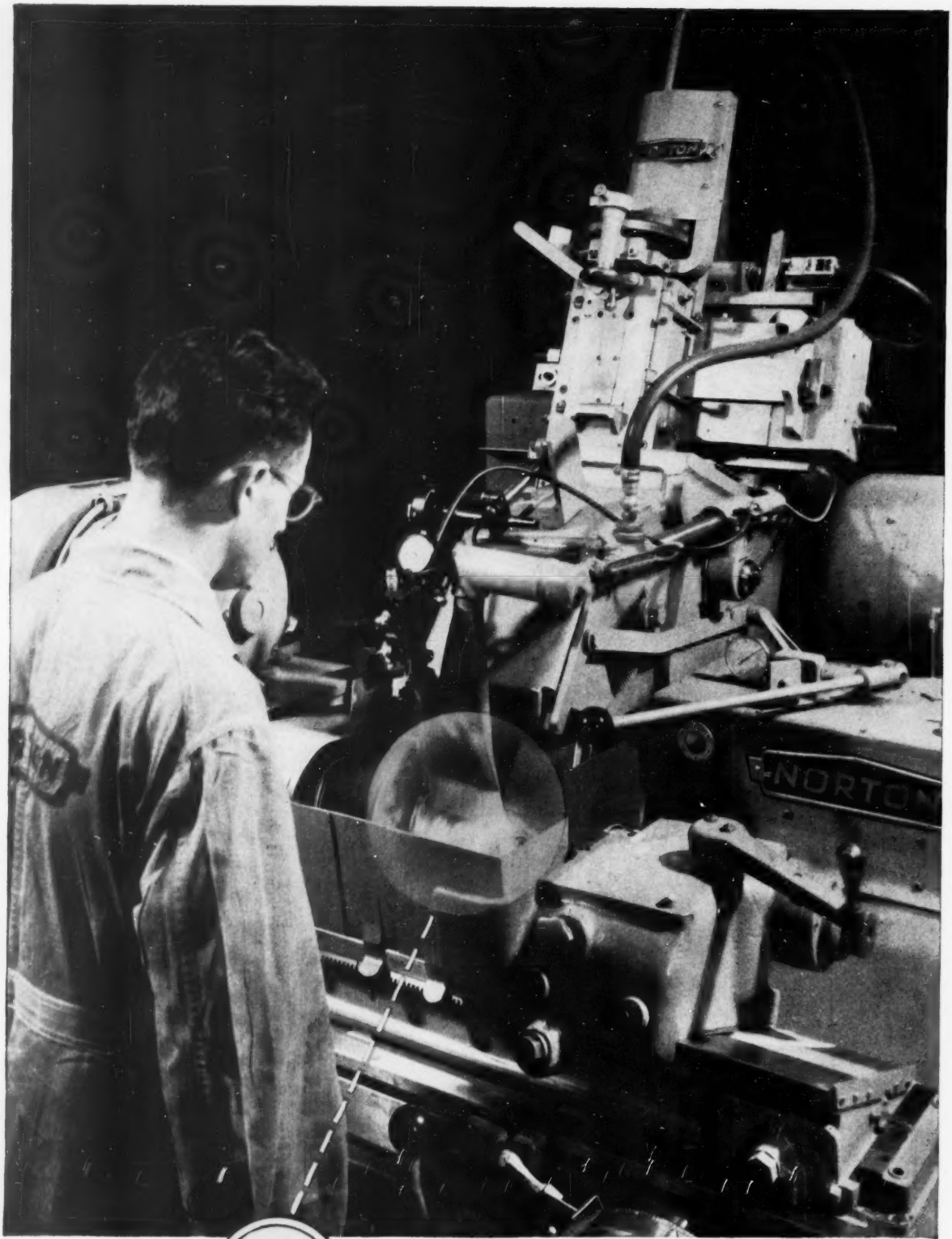
Bulletin 15-M contains complete specifications for all four sizes of U. S. Multi-Slide Machines. Ask for a copy.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories



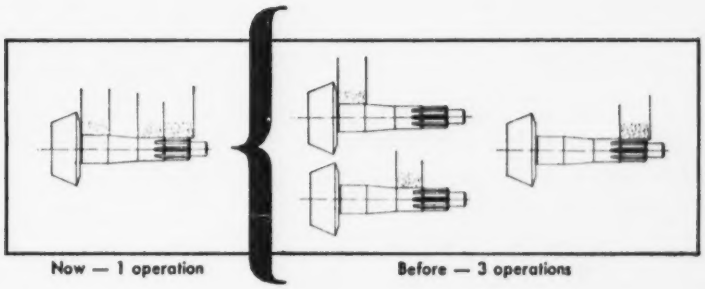
Up 128%

A big step forward in grinding operations, this Norton 10" Type CTU Semiautomatic Grinding Machine includes many advanced features. For example, the multi-wheel mount and automatic wheel guard type truing device help add the production-boosting, cost-cutting "Touch of Gold."

Now!...production increased 128% with this 3-way

"TOUCH OF GOLD"

A single Norton 10" CTU Semiautomatic replaces 3 separate grinders... cuts time, labor, costs



Here's an actual grinding job that shows clearly how advanced grinding techniques can reduce capital investment and step up production to new, profit-boosting highs.

THE PROBLEM. In producing an automotive part, a manufacturer was performing three separate grinding operations. Seeking to better his rate of 35 complete parts per hour per machine, he put his problem up to Norton engineers. They recommended replacing his three old-type machines with a single Norton 10" Type CTU Semiautomatic Grinder with multi-wheel mount and automatic truing device.

THE PAYOFF. Results were real eye-openers. The new Norton Grinder accurately performs all three operations at once . . . and produces 80 parts per hour for a rate increase of 128%!

Many examples of the "Touch of Gold"

That's just one of many instances of how Norton grinders and lappers assure the "Touch of Gold" that means sure savings in time, labor and money. There are many others. For example, another 10" Type CTU upped production from 300 to 600 parts per hour, replacing two old-type machines. And a 6" Type CTU more than doubled production of a part that previously required two separate grinding operations.

Why not add these advantages to your own production? Remember: only Norton offers you such long experience in both grinding wheels and machines to bring you the "Touch of Gold" — to help you produce more at lower cost.

For complete information, see your Norton Representative or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

***To Economize, Modernize With* NEW**

NORTON

GRINDERS and LAPPERS

Making better products... to make other products better

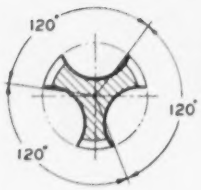
District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

For more information on products advertised, use Inquiry Card, page 247

BALANCED Action

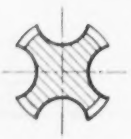
ALL WINTER TAPS HAVE IT

EXACT FLUTE SPACING



is the first fundamental of Balanced Action. It is accomplished by precision indexing.

UNIFORMITY OF FLUTE CONTOURS



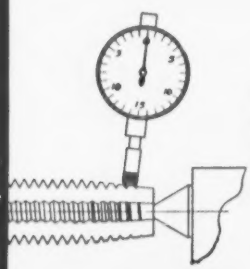
is essential, of course. You can't get Balanced Action without it.

PRECISION CHIP DRIVER CONTOURS



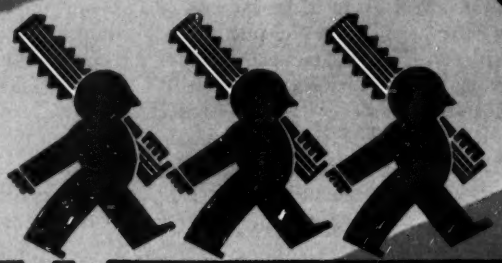
are exact to size, shape, and position —formed to give optimum performance.

ACCURATE AND CONCENTRIC CHAMFERS



By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy is assured.





WINTER

WINTER BROTHERS COMPANY

Rochester, Michigan, U. S. A. Stockrooms in principal cities
Branches in New York, Detroit, Chicago, Dallas, San Francisco
Division of National Twist Drill & Tool Co.

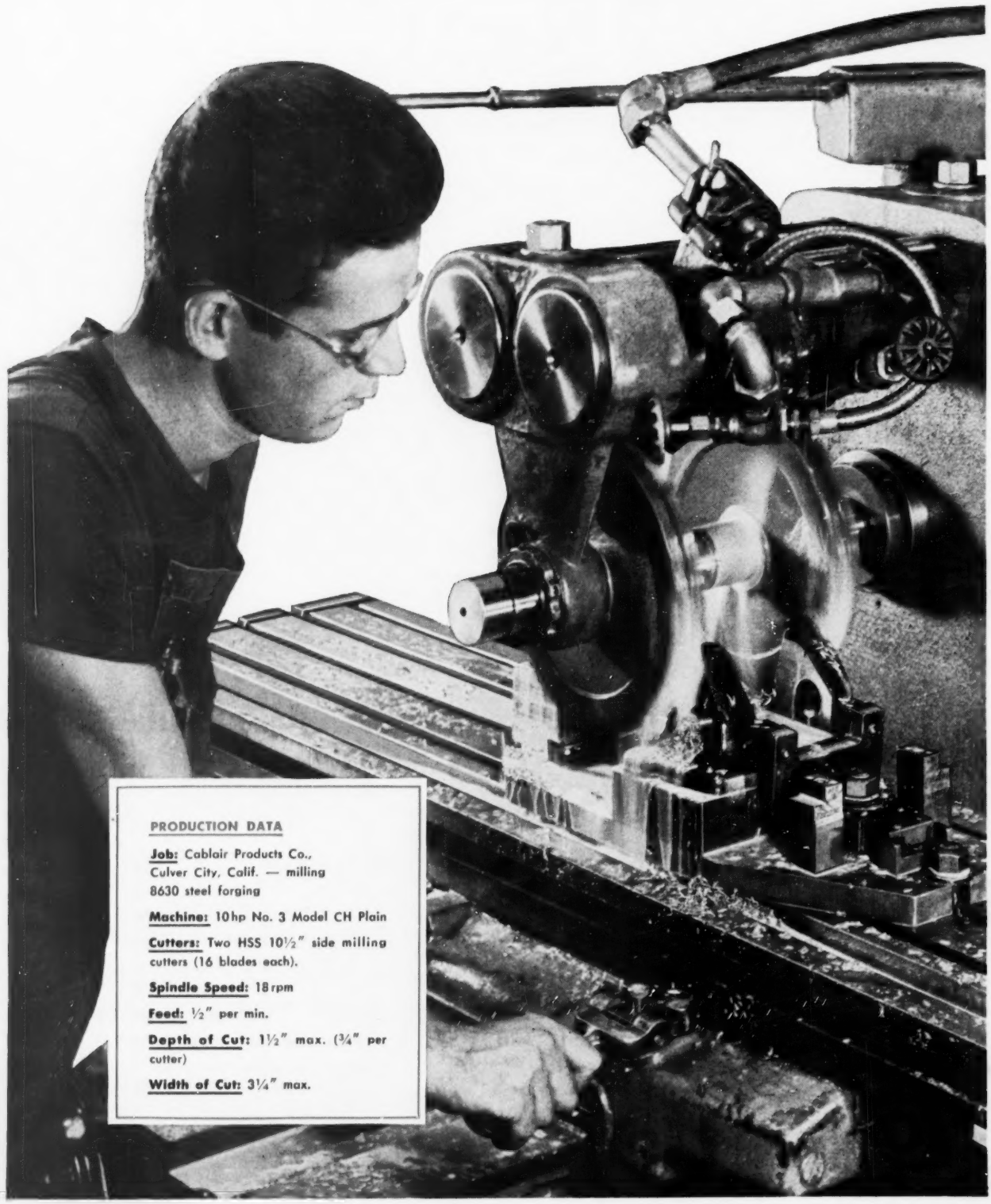
ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.




NATIONAL
TWIST DRILL
& TOOL
ROCHESTER, MICH. U.S.A.
National
NATIONAL
FOR
GENERAL WORK
NATIONAL
FOR
DEEP SLOTTING
NATIONAL
FOR
HEAVY DUTY
National Cutting Edges
WITH THE BITE
TO FIT THE JOB
NATIONAL METAL SLITTING SAWS—the choice of experienced tool users—are available in a wide range of stock sizes and widths. Many special types—also slotting cutters.
NATIONAL TWIST DRILL
AND TOOL COMPANY
Rochester, Michigan, U.S.A.
Distributors in principal cities. Factory Branches: New York, Detroit, Chicago, Dallas, San Francisco.
"CALL YOUR INDUSTRIAL SUPPLY DISTRIBUTOR"
. . . For all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools.

Getting right speed



PRODUCTION DATA

Job: Cablair Products Co., Culver City, Calif. — milling 8630 steel forging

Machine: 10hp No. 3 Model CH Plain

Cutters: Two HSS 10½" side milling cutters (16 blades each).

Spindle Speed: 18 rpm

Feed: ½" per min.

Depth of Cut: 1½" max. (¾" per cutter)

Width of Cut: 3¼" max.

selection for tough forgings—

no problem with a CH machine!

● This Kearney & Trecker No. 3CH 10 hp Milling Machine mills 100 steel forgings between cutter grinds. Previous average was only 18 pieces!

Milling tough steel forgings might have presented a difficult production problem if this manufacturer had not owned a versatile No. 3CH miller. Tough material, the necessary speeds and size of cut combined to produce excessive cutter wear. An average of only 18 pieces could be machined before cutters had to be reground. This situation, unremedied, would have seriously restricted output and increased costs.

However, the CH miller's design provides a wide range of 24 spindle speeds (15 to 1500 rpm). By utilizing this feature, and selecting an appropriate coolant, the manufacturer *increased cutter life by over 500%!* Today, uninterrupted runs of 100 pieces are average.

This case is only one of hundreds where CH design features provide the versatility to easily meet common as well as unusual machining problems.

For details on Kearney & Trecker CH machines, contact your representative or write to Kearney & Trecker Corporation, 6784 West National Ave., Milwaukee 14, Wis., for illustrated brochure.



Check these important CH features

Extra wide feed range — 32 changes from 3/8" to 90" per minute meet requirements of new metals and cutting tools.

Greater rigidity — entirely new column . . . heavily ribbed, box section, sponson construction . . . absorbs vibration from heaviest cutting loads.

Smoother feed performance through a heavy duty 2" dia. table feed screw. Extra large bronze nut provides greater bearing contact for longer screw life and backlash elimination.

Greater horsepower through independent drives for spindle, feed and rapid traverse, and coolant. 10 hp delivered to spindle . . . 3 hp for feed and rapid traverse . . . 1/4 hp for coolant.

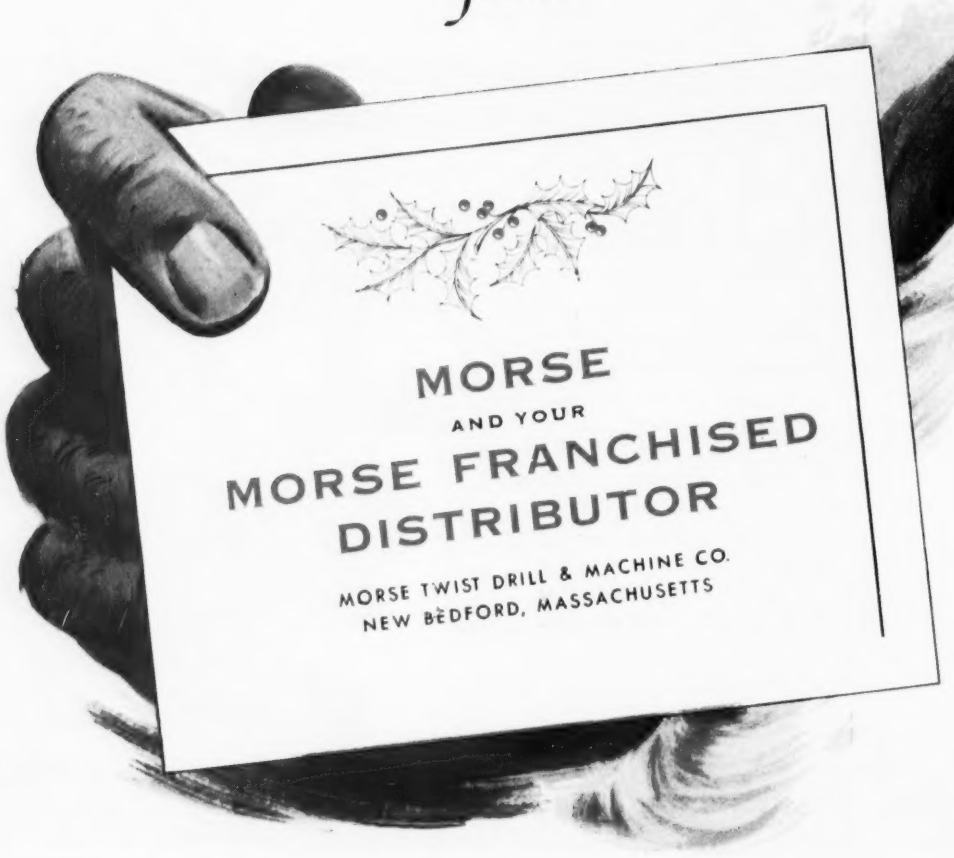


Kearney & Trecker 10 hp No. 3CH Milling Machine.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Once again...our merry, mutual friend brings you

Best Wishes for Christmas and the New Year from







The Old Fashioned Plug Is Out Moded In This Fast-Rolling MODERN Age

Users everywhere say:

DuBo* is the MODERN Plug Gage

*U.S. and Foreign Patents Granted



Gaging Surfaces are Portions of a Sphere

Operates by Tilting Handle

Whether handle will drop freely or not is the definite yes-or-no indication. No guesswork, no forcing, no fumbling!



COLOR Gives INSTANTANEOUS "FOOL-PROOF" INDICATION of GO and NO GO

For Quality Control

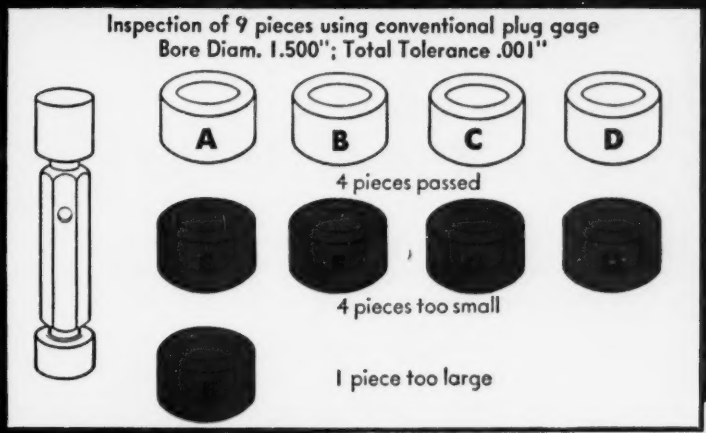
NO plug gage can equal DuBo

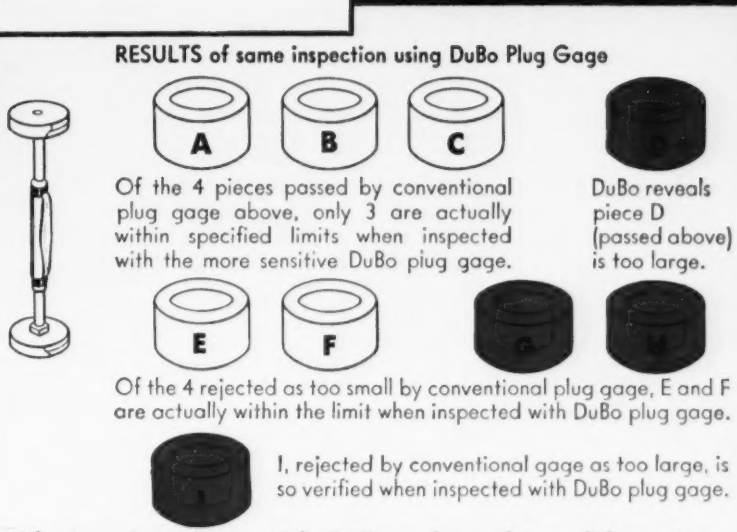
- . . . IN ACCURACY
- . . . IN EASE OF HANDLING
- . . . IN SENSITIVITY
- . . . IN LIGHT WEIGHT
- . . . IN LONG TERM SERVICE
- . . . IN COST SAVING AND PROFIT

Like so many items of modern design, DuBo Plug Gage *looks* different and *feels* different from the conventional plug gage. And even craftsmen of the old school, used to time-worn methods, quickly get the feel and take pride in the use of this *different* tool. *Added to that are the many actual cases where DuBo, after a fair trial, has replaced conventional plug gages.*

With exceptional ease of handling, DuBo gives a precise, definite and sensitive check of bore diameters, directly and with no element of confusion, even in unskilled hands. In the same application, DuBo reveals dimensional variations such as taper and out-of-round which ordinary plug gages cannot indicate.

An ABC Demonstration of DuBo* Plug Gage *Superiority*





Of nine pieces inspected, DuBo reclaimed two false rejects and rejected one piece that had been passed by ordinary plug gage inspection. Apply even a fraction of this ratio to a day's production in your own plant and you'll realize the advantage of using DuBo Plug Gages.

COST-SAVING FACTORS

DuBo Plug Gages outlast ordinary plugs many times. Extremely light in weight (in the larger sizes, 70% to 80% lighter than cylindrical plug gages of equivalent diameter) and requiring no jockeying into position for entry, DuBo effects economies in that important cost item, actual inspection time.

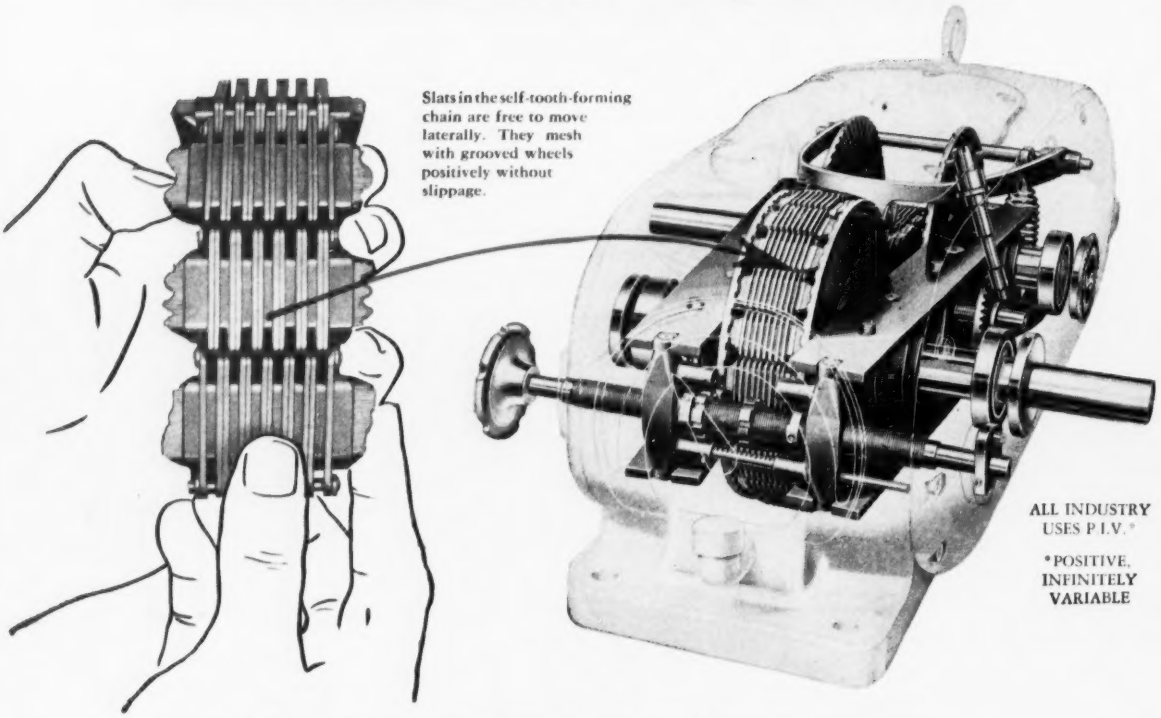
Use DuBo for Precision Plug Economy

When inspecting parts under quality control sampling procedure, it is important that those parts which may be close to either end of the tolerance range be properly classified. The definiteness and simplicity of DuBo gaging is a decided advantage in this type of inspection. Anyone who has tried to enter a cylindrical plug into a hole only .0001" larger than the gage, knows how difficult it is. For even skillful workers there is a point at which it becomes doubtful whether the bore is actually smaller than the gage size, or if it is larger and merely close. With DuBo Plug Gage, even an unskilled worker can easily enter the gage under any condition and quickly interpret bore conditions correctly. There need be no border-line cases of doubt regarding the proper classification of a bore. Use of the DuBo Plug Gage minimizes the cost of parts needlessly rejected and the expense accruing from those incorrectly passed.

TRY DuBo! Sense its craftsmanlike feel and balance. See how easily it enters, even in undersize bores . . . how gentle manipulation of the handle accurately reveals internal conditions. Use it on a *fussy* job and you'll KNOW why DuBo is replacing old time plug gages everywhere! Refer to Catalog C, Pages 18, 19, 20, 21. Or, write or phone for more detailed information.

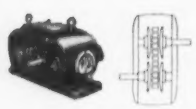


Completely POSITIVE...
Completely STEPLESS
with an infinite number of speed changes

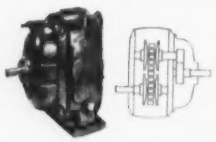


P.I.V. Variable Speed Drive gives you exact selection from maximum to minimum speed

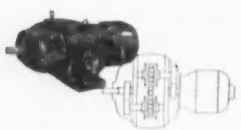
4 of 16 P.I.V types, ½ to 25 hp.—ratios to 6:1
Horizontal or Vertical Mountings



Basic Positive, Infinitely Variable Speed Drive. Compact.



P.I.V. with single reduction input or output helical gears.



Motorized P.I.V. with single reduction input and output helical gears.



Motorized P.I.V. with single reduction input and double reduction output helical gears.

ONLY Link-Belt's P.I.V. Variable Speed Drive uses self-tooth-forming chain to provide positive, stepless speed changing. The chain meshes with grooved wheels, transmits power without wasteful slip.

What's more, Link-Belt's P.I.V. changes speeds accurately under full load, delivers full-rated horsepower to your machines. That's because P.I.V. is not dependent on friction for power transmission. Its all-metal construction is not affected by atmospheric conditions.

Adjustment is easy. You can obtain an infinite number of speeds with manual, electric, pneumatic or hydraulic controls . . . hold the exact speed you need at any setting.

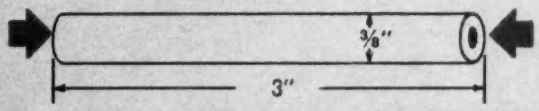
There may be a process in your plant that requires exact, variable speed transmission. If so, it will pay you to contact your nearest Link-Belt office. They'll show you how P.I.V. can increase the flexibility and efficiency of your machines. Send for Catalog No. 2274.

LINK-BELT P.I.V. VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities. 13,118

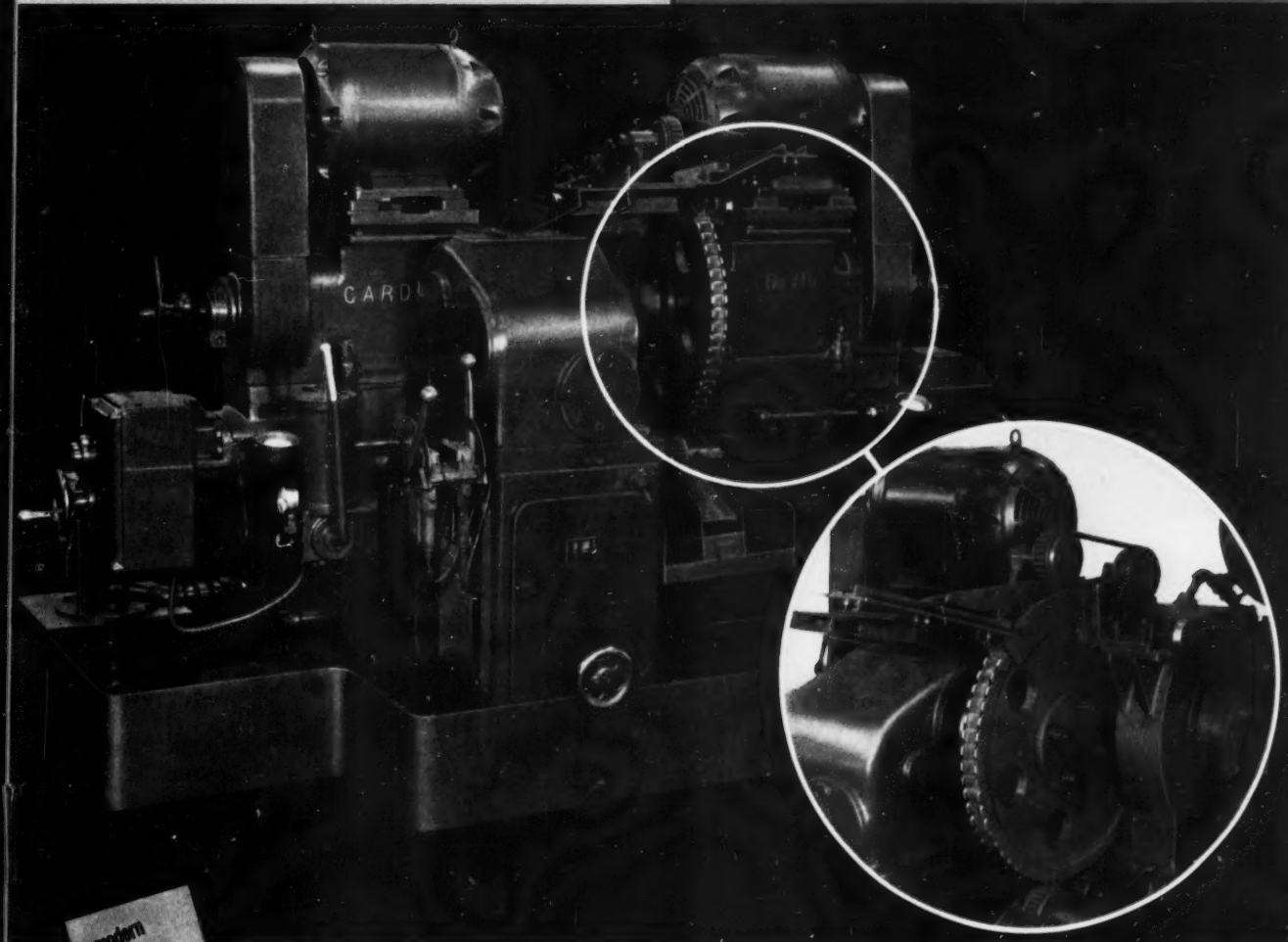
WORK DATA

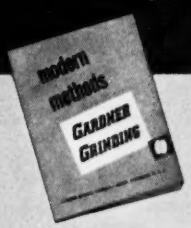
MACHINE	Gardner No. 115—18" Double Spindle Grinder
TOOLING	Rotary work carrier with gravity feed chute and chain hold down
PART	Electrical relay core
STOCK REMOVAL	Averages .015" to .020" overall
TOLERANCES	.0005" to .001" for flatness, parallelism and squareness; .0015" for uniformity
PRODUCTION	3600 cores per hour



Output of relay cores increases by 20% after modern Gardner Grinder replaces older machine

TWO surfaces ground in **ONE** operation





No. 126M

Write for booklet that gives valuable ideas on how to lower unit costs.

GARDNER MACHINE COMPANY
414 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER

precision disc **Grinders**

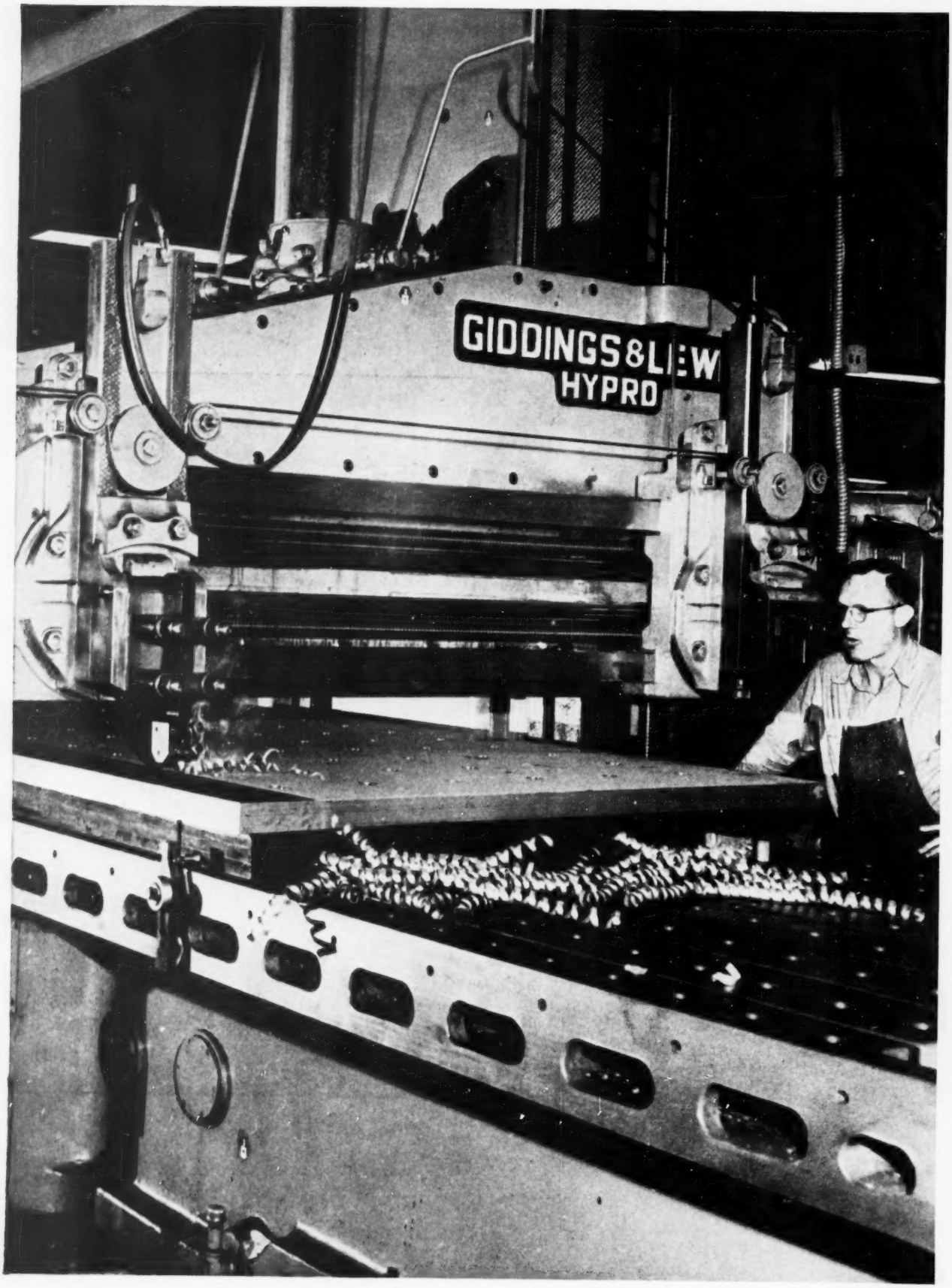

GIDDINGS&LEW
HYPRO



Photo courtesy of
TEMCO Aircraft Corporation
Dallas, Texas

Metal Surgeon...

with a flair for general practice

Performing with speed and precision this G & L Openside Planer gives you a highly versatile tool to handle both common and uncommon work with equal efficiency

Productive flexibility . . . that's one of the many big advantages of using a G&L Planer such as this Hypro Openside machine. Whether it's a simple or complex job . . . long or short run . . . big or small workpiece — this versatile machine completes it in minimum time with a minimum of setups.

Its openside construction allows you to handle workpieces up to 120 inches in width. Table lengths can be furnished in the proper size you need, and horsepowers range up to 100. Smooth, responsive control minimizes tool breakage, and outstanding rigidity allows holding tolerances within ten-thousandths.

For complete information on the G&L line of Openside or Double Housing Planers, see your representative or write —

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty machine tools—Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers; Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

What is it costing you NOT to replace your TURRET LATHES?

IT MAY be costing your company a great deal of money not to replace its old machine tools.

Here's what we mean—in dollars and cents. One company we know replaced two old turret lathes with one new Warner & Swasey No. 4 Universal. Output more than doubled and the company saved over $3,400 a year. Another company invested in a new 4-A Heavy Duty Warner & Swasey and reduced unit cost from $2.60 to $1.26 per piece.

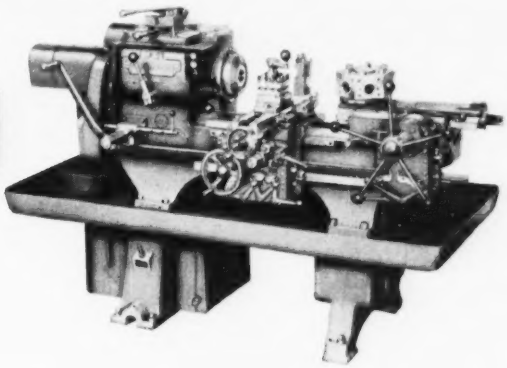
These are but two examples. Our files are full of others.

The point, of course, is this: These savings might well be yours—savings through increased production which cuts costs—which in turn enables you to get and handle additional business.

You may never know just how much it really *is* costing you not to replace, until you call in your turning specialist—your Warner & Swasey representative. He'll be glad to make a detailed analysis of your operation—show you how, by replacing old machine tools, you can increase your profits . . . substantially!

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER &

RAM TYPE



NO. 2 ALL-GEARED HEAD
1" Bar Capacity—14" Swing

NO. 3 UNIVERSAL
1½" Bar Capacity—15⅜" Swing

NO. 4 UNIVERSAL
2" Bar Capacity—18⅛" Swing

NO. 5 UNIVERSAL
2½" Bar Capacity—20" Swing

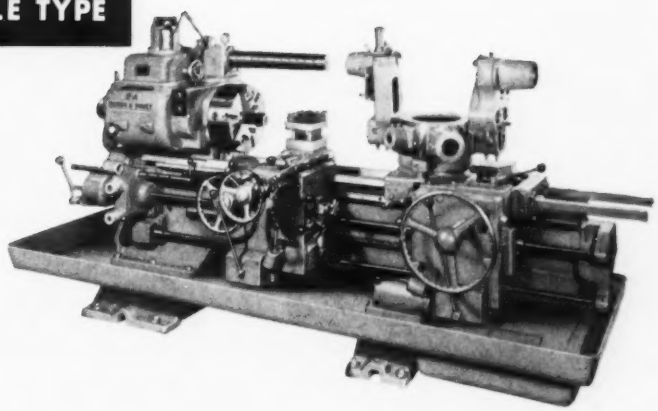
SADDLE TYPE

1-A UNIVERSAL HEAVY DUTY
2½" or 3" Bar Capacity—16¼" Swing

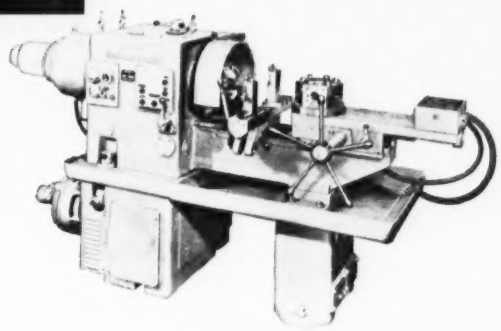
2-A UNIVERSAL HEAVY DUTY
3½" Bar Capacity—20" Swing

3-A UNIVERSAL HEAVY DUTY
4½" or 6" Bar Capacity—23½" Swing

4-A UNIVERSAL HEAVY DUTY
8", 9" or 12" Bar Capacity—28¼" Swing



ELECTRO-CYCLES



NO. 1 ELECTRO-CYCLE
⅝" Bar Capacity—11" Swing

NO. 2 ELECTRO-CYCLE
1" Bar Capacity—14" Swing

NO. 3 ELECTRO-CYCLE
1½" Bar Capacity—15⅜" Swing

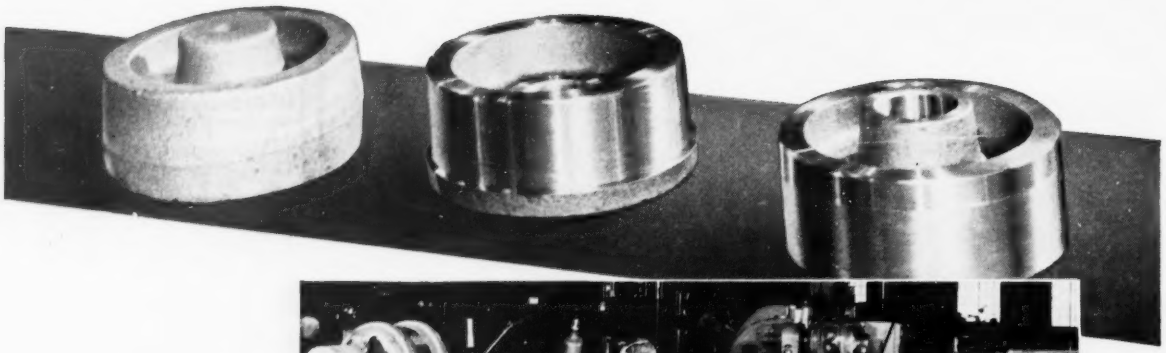
16" ELECTRO-CYCLE
1½" Bar Capacity—16⅞" Swing

● There is a proper size Warner & Swasey Turret Lathe to fill your turning needs, for it has always been a cornerstone of Warner & Swasey design to build an individual model for each range of work.

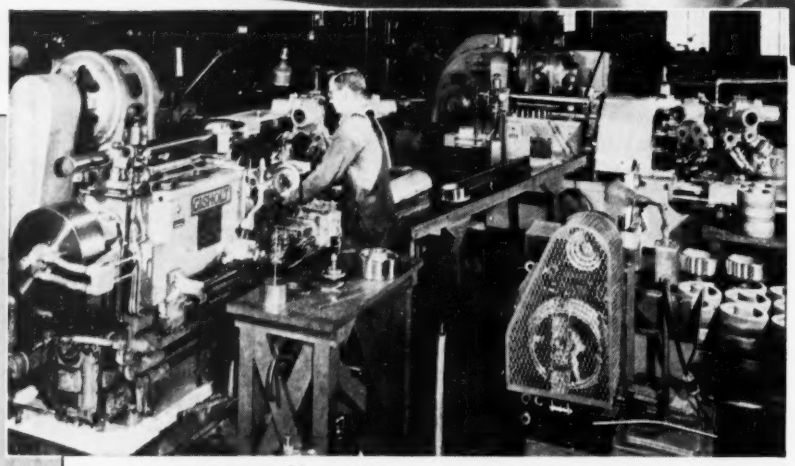
Whatever Warner & Swasey best fits *your* specific requirements, you'll get accuracy to meet your own exacting standards . . . fast production with minimum scrap loss . . . adaptability to scores of turning jobs.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

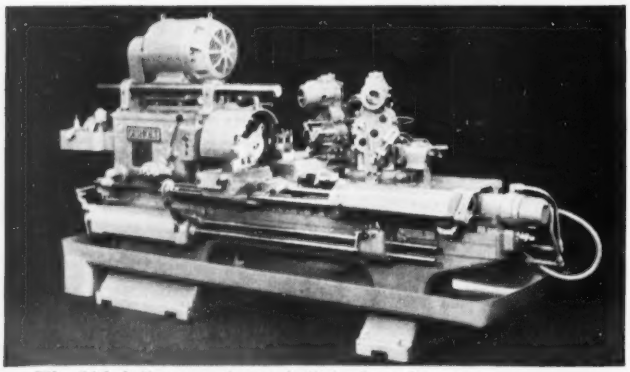
SWASEY MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY



from
41.9 Minutes
down
to
15 Minutes



That's Productivity with the GISHOLT FASTERMATIC



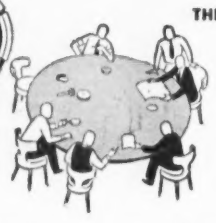
The Gisholt Fastermatics are built in three sizes ranging from 21" to 36½" swing over bed.

The cost of machining these gear blanks at the Falk Corp. took a sharp drop when the Fastermatics took over. Time was cut nearly two-thirds. Moreover, human errors were eliminated, thanks to Fastermatic's ability to hold close tolerances.

One operator tends 2 Fastermatics and a honing machine. Simple tooling makes it possible to handle 9 different sizes of gear blanks.

These modern automatic turret lathes enable you to handle a larger number of operations in one chucking—and cut costs to the bone on a wide variety of work. Ask for facts about them.

GISHOLT



THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

For more information on products advertised, use Inquiry Card, page 247



Why operators are dreaming of a ~~White~~ PINK Christmas

. . . Because pink CIMCOOL°—the radically new and different cutting fluid—is *one of the greatest working improvements in years.* It leaves no slippery film on shoes, floor, machine or work. It doesn't soil clothing or hands. It contains no skin irritants.

And look at some other reasons why machinists say *every day* is Xmas when Cimcool is on the job: Can't smoke. Can't burn. Virtually eliminates rancidity and foul odors. Cools so fast that tools and chips actually stay cool to the touch. And this revolutionary chemical emulsion *does a better job.*

So why not make their dream become *a reality* by switching to Cimcool? If you want proof that Cimcool *makes jobs better while doing a better job,* we'll be happy to provide a demonstration. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

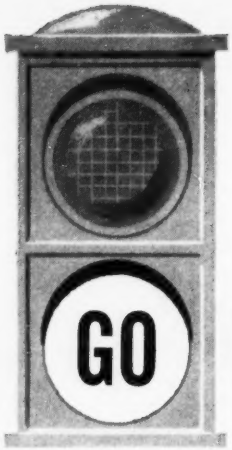


CIMCOOL

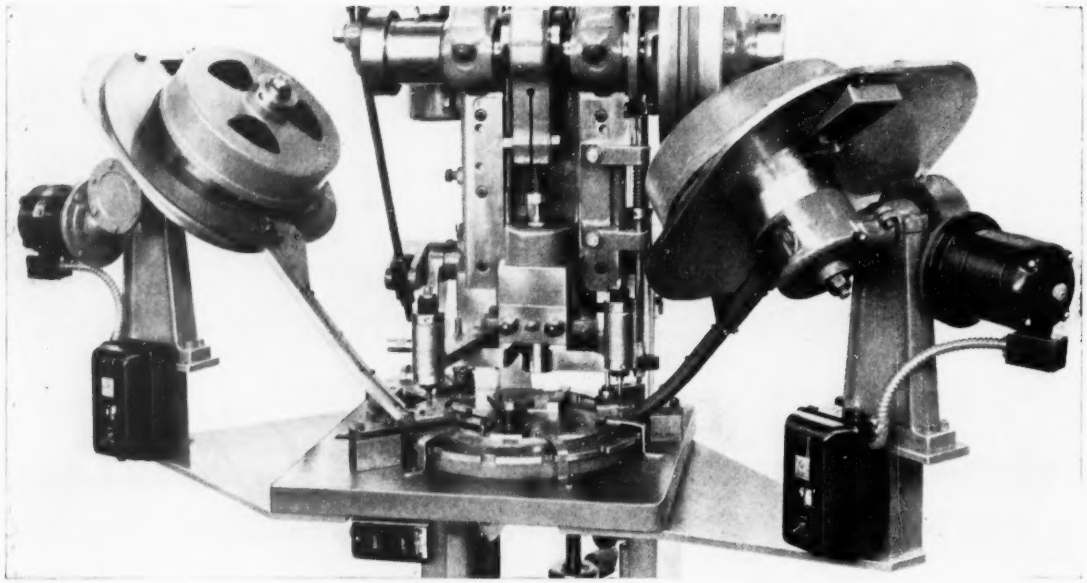
for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

When you run V & O long slide presses you can inspect an occasional few of your stampings and be sure that the others are exactly like them. And when you can do that, when your machines operate with such consistent precision that random or chance imprecisions are statistically unlikely, then you have quality control.



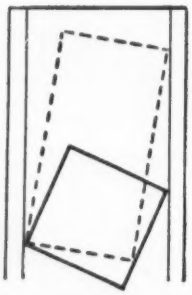
FOR QUALITY CONTROL GO V&O



V & O long slide press that automatically feeds and assembles two parts from their individual hoppers, 128 strokes a minute.

INVITATION TO INGENUITY

V & O long slide design provides space for precision-promoting tooling. Ingenious design can apply moving and stationary members that make random operating imprecisions statistically unlikely.



THE LONG SLIDE PRINCIPLE

eliminates the random imprecisions that can come from stroke misalignments.

The longer the slide the less can be the angular misalignment.

THE V & O PRESS COMPANY

DIVISION OF EMHART MFG. CO.

HUDSON NEW YORK

BUILDERS OF PRECISION POWER PRESSES AND FEEDS SINCE 1889



Only the best is good enough

For more information on products advertised, use Inquiry Card page 247

Merry Christmas AND A Happy New Year



to you-and you — and especially You

With the approach of the Holiday Season we all look forward to the year ahead — pause and reflect on the one just closing. Regardless of our accomplishments we all resolve to do a better job in our respective fields of endeavor. You, too, can do a better job in '54 and many years ahead with Bullard Machine Tools illustrated on the following page.

BULLARD

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

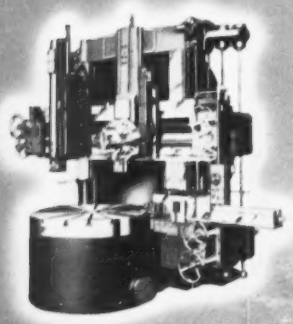
Specify BULLARD MACHINE TOOLS for greater manufacturing economy and efficiency.....

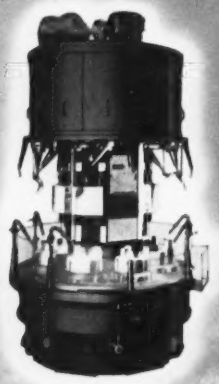
MULT-AU-MATIC
Type "D" — 8"—12"—16" with 6 or 8 Spindles,
Type "D" 16-23" and Type "K" 6 Spindles
— and 6 twin Spindles — 8
Spindles and 8 twin Spindles.

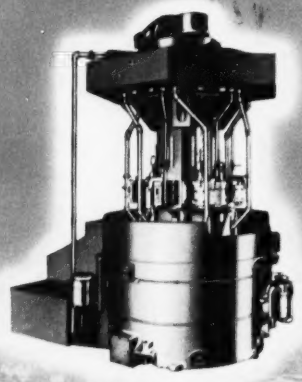
CONTIN-U-MATIC
Type "RD" with 4-6 or 12 spindles.
Sizes 10"—14"—20".

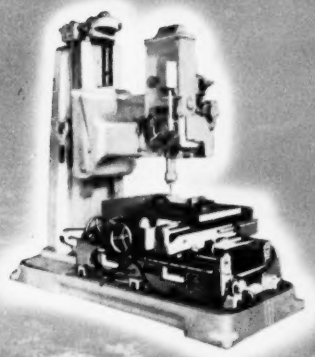
CUT MASTER V. T. L.
In six sizes 30"—36"—42"—54"—64" and 74".
The 30" and 36" sizes have two heads
while the 42"—54"—64" and 74"
have three heads obtainable
in various combinations.

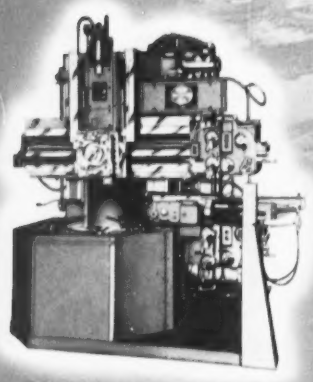
SPACING TABLE
30 x 20 Spacing Table mounted on
Super Service Drilling Machines
or 4'—5' and 6' Radial Drills.



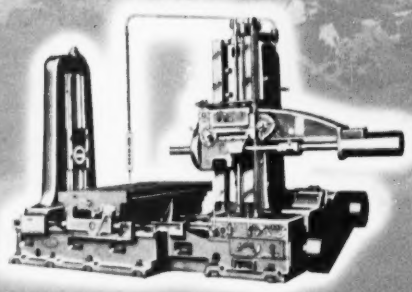




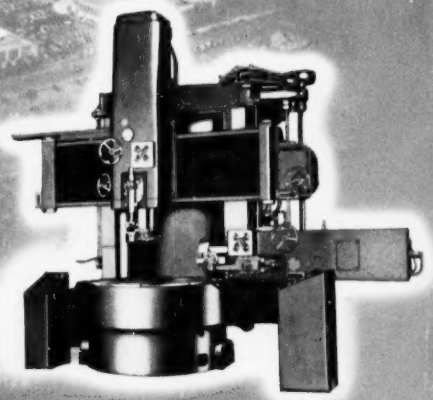




MAN-AU-TROL V. T. L.
In six sizes 30" and 36" with two heads.
42"—54"—64" and 74" with three heads.



HORIZONTAL BORING, MILLING AND DRILLING MACHINE
4" and 5" Spindle with various bed lengths and post heights.



VERTICAL CHUCKING GRINDER
Six sizes, 30" to 74" are available
with a variety of head combinations.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

Sales offices in: Chicago, Ill.; Milwaukee, Wisc.; Rock Island, Ill.; Cleveland, O.; Dayton, O.; Pittsburgh, Pa.; Detroit, Mich.; Indianapolis, Ind.; South Bend, Ind.; Boston, Mass.; Philadelphia (Narberth), Pa.; Syracuse, N. Y.; and Bridgeport, Conn.

Distributors in other principal cities in the United States, Canada and throughout the world.

"with **GULF LASUPAR CUTTING OIL** we get better finishes, longer tool life on B-1113 steel parts"

says Guy Hack, Holt Products Co., Holt, Mich.



"Gulf Lasupar is the ideal cutting oil for high production-close tolerance work on automatics," says Mr. Hack. "Not only do we get longer tool life and better finishes, but we have found that this quality cutting oil provides corrosion-free lubrication of machine bearings."

Send the coupon below for a copy of the pamphlet "Gulf Lasupar Cutting Oil," which gives all the facts on how this outstanding cutting fluid can help you improve your machining practice.

GULF SERVES INDUSTRY

Gulf Oil Corporation · Gulf Refining Company M
1822 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of your pamphlet, "Gulf Lasupar Cutting Oil."

Name .....

Company .....

Title .....

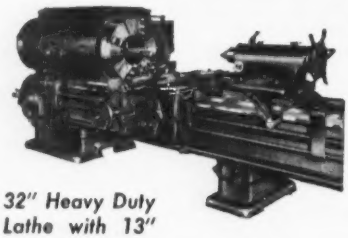
Address .....

The First Lehmann HYDRATROL Lathe Ever Sold is Still Going Strong!



18 Years of Grueling Service for Lathe #5155

Here is dramatic proof of the durability and rugged dependability of Lehmann HYDRATROL Lathes! The first Lehmann HYDRATROL, sold over 18 years ago, is still operating every day. The present owner of this Lathe, A. J. Flowers of the W. L. Flowers Machine and Welding Co., Alice, Texas, recently wrote us: "We are happy to say we are still operating the Lehmann Lathe Serial No. 5155. We have averaged operating the lathe sixteen hours each day. It is giving excellent service."



32" Heavy Duty Lathe with 13" Hole in Spindle

FIVE SIZES—18" to 36"

Small	18" up to 7½" Hole
Medium	25" up to 12" Hole
Large	32" up to 13" Hole
Large	36" up to 16½" Hole

(Standard type lathes, 16" to 36")

Remember these important HYDRATROL features:

• 16 spindle speed changes with only a "Twist of the Wrist" • Automatic slide rule co-ordinated with movement of handle shows spindle revolutions per minute and indicates cutting speeds in feet per minute • 16 forward and 8 reverse speeds • No need for intermediate stop; unnecessary to disengage the friction driving clutch to change speed • Hydraulic friction clutches and hydraulic brakes, self compensating • Automatic safety relay for harmless and easy engagement of positive clutches when speeds are changed • Spindle release for chucking • Safety-control lubrication with filtered oil • Gears constantly in mesh • Safe in operation • Simple construction and operation.

For Catalog, additional information or recommendation write:

LEHMANN MACHINE COMPANY
GRAND at CHOUTEAU • ST. LOUIS 3, MO.

DIVISION OF NOVO ENGINE CO.

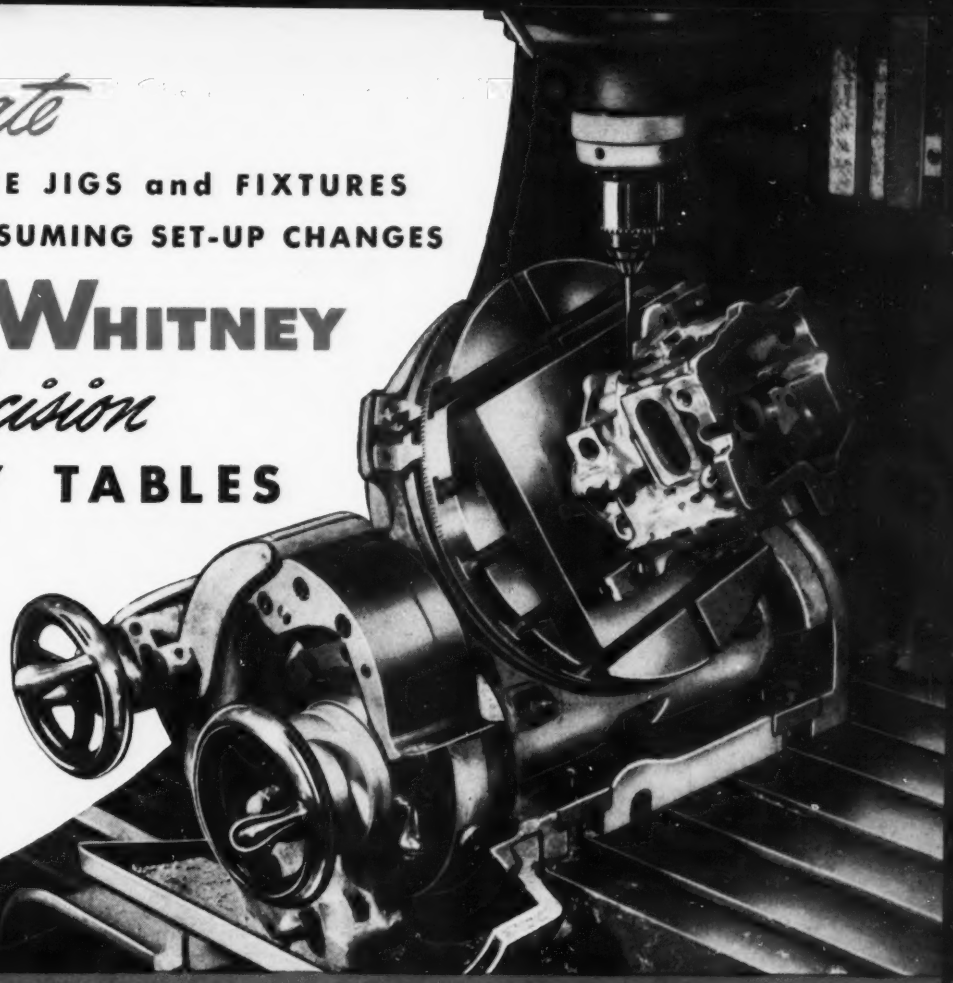
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Eliminate

EXPENSIVE JIGS and FIXTURES

with **TIME-CONSUMING SET-UP CHANGES**

PRATT & WHITNEY *Precision* ROTARY TABLES



HERE'S PROOF

1730 DIFFERENT CLOSE-TOLERANCE OPERATIONS including face milling, side milling, drilling, boring, counterboring, tapping and reaming were performed on the work piece shown here. No special fixtures were required and the whole job was completed . . . **IN JUST 2 SET-UPS** on a **P&W 16 INCH TILTING ROTARY TABLE!**

TO MEET ALL REQUIREMENTS . . .

3 Basic Types

VERTICAL

TILTING

PLAIN



- **From 10 INCH to 50 INCH DIAMETERS**
- **AVAILABLE . . .**
  Plain Rotary Tables, 12" and 20" dia.; Motor-Driven Plain Rotary Tables, 24", 30", 42" and 50" dia.; Tilting Rotary Tables, 10", 14" and 24" dia.; Motor-Driven Vertical Rotary Tables, 20" dia.
- **USED ON A WIDE VARIETY OF MACHINES OR ALONE . . .**
  for Hundreds of Different Applications



SEND COUPON FOR COMPLETE INFORMATION

First Choice for Accuracy

MACHINE TOOLS • CUTTING TOOLS • GAGES

BRANCH OFFICES . . . BIRMINGHAM • BOSTON • CHICAGO
CINCINNATI • CLEVELAND • DALLAS (The Stonce Co.)
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PRATT & WHITNEY

DIVISION NILES-BEMENT-POND CO.

12 CHARTER OAK BLVD., WEST HARTFORD, CONN., U.S.A.

Please send my copy of the new P&W Precision Rotary Table Circular No. 558.

NAME _____

POSITION _____

COMPANY _____

CO. ADDRESS _____

CITY _____ ZONE ___ STATE _____

Combine WESSON TOOL ENGINEERING SKILL and EXPERIEN

Our 30th Year In Carbide!

This New WESSON Engineere TOOL HOLDER

ROUGH TURNS HOT FORGED 155 MM SHELLS



The rugged strength and durability of the Wesson Holder is obvious in above picture. Chip wear is on the replaceable band.



STYLES PAR-B and PAL-B

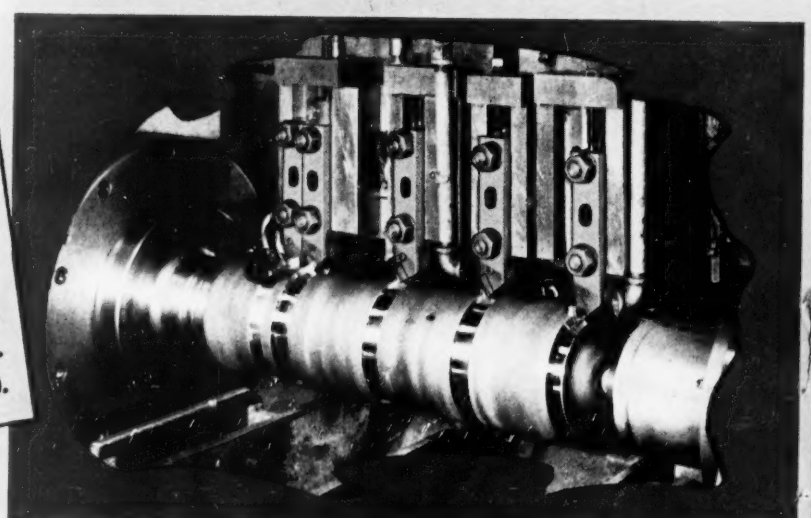
WESSON MULTICUT PARALLELOGRA BAND TYPE HOLDER

WESSON BAND TYPE HOLDERS ARE VIRTUALLY INDESTRUCTIBLE EVEN UNDER ABNORMAL CONDITIONS. THE STEEL BAND IS REPLACEABLE AT VERY LOW COST. 101 DIFFERENT STANDARD STYLES AND SIZES ARE AVAILABLE.

ACTUAL JOB SETUP HOW AT A LARGE SHELL MANUFACTURING CO.

Part.....155 MM hot forged shell.
Operation.....Rough turning.
Machine..Burleigh Stocker Hydra-Feed automatic lathe.
Tools.....5 Wesson Multicut Band Type Parallelogram Tool Holders with Parallelogram Wesson-metal insert grade WM.
Depth of cut.....Up to 1" maximum.
Feed.....032 per revolution.
S.F.M.....320.

The Wesson Tool Engineer in your area has full details on this job. Ask him about Case History #135.



This photo, taken while the machine was running shows the depth of cut and type of finish obtained by rough turning with Wesson Holders and Wesson-metal insert. Note extra holder strength possible with the parallelogram insert. The lead angle is 25°.

WESSON COMPANY

1220 WOODWARD HEIGHTS BLVD. FERNDALE (DETROIT 20), MICH.

with WESSONMETAL HIGH PERFORMANCE *for Increased Production . . .*

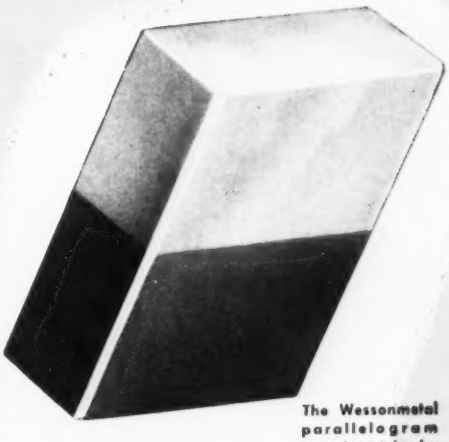
And *This* WESSONMETAL INSERT

WITH CUTS UP TO 1" DEEP!

Another FIRST for WESSON

with Tool Costs Reduced by Over 60%
Production Increased 400%

OLD METHOD	NEW WESSON METHOD
Tool Cost.....$37.50	Tool Cost.....$50.00
Useable Carbide.....3/8"	Useable Carbide.....5/16"
Average Pieces per Grind...60	Average Pieces per Grind...60
Pieces Machined per Tool..420	Pieces Machined per Tool..1680
Tool Cost per Piece.....8.1c	Tool Cost per Piece.....2.9c
Down Time for Tool Change... 15 min. every hour	Down Time for Tool Change... 4 min. every hour



The Wessonmetal parallelogram type insert is designed for strength and durability.

½" x 1" x 1½" either solid or with brazed steel slug on bottom for back up screw contact.

WESSONMETAL IS OUTSTANDING FOR HIGH PERFORMANCE BECAUSE IT IS UNIFORMLY DEPENDABLE IN QUALITY

WESSONMETAL is available in 8 grades for all types of metal working.



SEE THE DRAMATIC STORY OF CARBIDE in Sound and Color "THIS CARBIDE AGE"

There's a Wesson Tool Engineer in your area who will give you full details about this fine educational movie. Call him or write.

WESSON METAL CORPORATION

LEXINGTON 34, KENTUCKY



Let an Expert solve your Cutting Oil Problem...

Hundreds of machine shops, large and small, have eliminated the *chance of error* in selecting the correct cutting fluids for their varied operations.

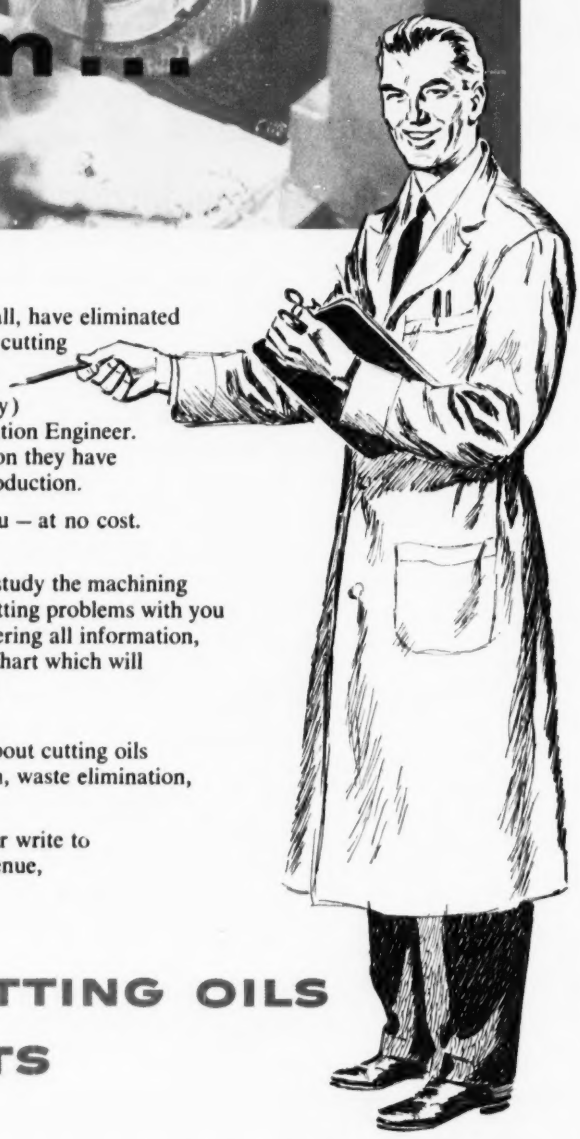
They solved this common (and often costly) problem with the help of a Sinclair Lubrication Engineer. And by using the right oil for each operation they have improved work quality and stepped up production.

The same expert service is available to you – at no cost. Here's how it works.

Call in a Sinclair Lubrication Engineer to study the machining operations in your shop. He will discuss cutting problems with you and your production personnel. After gathering all information, he will prepare a comprehensive, detailed chart which will guide you quickly to the correct cutting oil for any particular operation.

In addition, he will brief your personnel about cutting oils and coolants – storage, mixing, application, waste elimination, sanitation, etc.

Phone your local Sinclair Representative or write to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.



SINCLAIR CUTTING OILS and COOLANTS

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READ ALL ABOUT THE LATEST IN AIR GAGING

JUST OFF THE PRESS, this book contains up-to-the-minute, complete specifications for the Dimensionair. It explains the important advantages of the new balanced air system. It also tells about our entirely new air gage accessories — the Arnold Air Grinding Gage, Air Electric Switch, and Air Gaging Electronic Controls. You will also find useful tables showing plug, ring, and air snap sizes available from stock. Here, conveniently available in one attractive catalog, is a fund of the latest authoritative reference data on the Air Gage, developed by Federal during many years' study of actual shop use requirements and engineering research. Ask for your copy today and profit from this valuable new book.





You need this new catalog. See the handy diagrams and information-packed pages. Here's a book that fully covers the latest developments in air gaging.

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Largest manufacturer devoted exclusively to designing and manufacturing all types of DIMENSIONAL INDICATING GAGES

FEDERAL PRODUCTS CORPORATION
1112 Eddy Street, Providence 1, Rhode Island

Please send me your new catalog on Air Gaging.

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GORTON *Brings You* High Production

Automatic Profiling of CAMS AND CAM-LIKE SHAPES



Gorton Contour Mill, CM-12, Produces Extreme Accuracy and High-Surface Finish with Minimum Maintenance

This machine produces highly accurate, identical pieces — complicated cam shapes, external or internal, or continuous grooves and slots of irregular radii. The Gorton Contour Mill is easy to use and versatile — a simple tracer-controlled, vertical-head milling machine with two rotary power-driven tables. No complicated electronic, hydraulic or pneumatic controls.

CAPACITY . . .

Wide spindle-speed range — 300 rpm to 10,000 rpm — for either high-speed steel or carbide cutters, burrs or grit grinding wheels. The 16-inch master-copy table easily accommodates larger master cams. Several thin cams can be stacked and profiled at once.

EXTREME ACCURACY . . .

Operation depends upon a heavy, single-pivot beam which provides more accuracy than can be built into the tooling. A choice of several reduction ratios adds to accuracy and provides low micro-inch finishes. The reduction ratio principle produces piece parts to closer tolerances than those of the master.

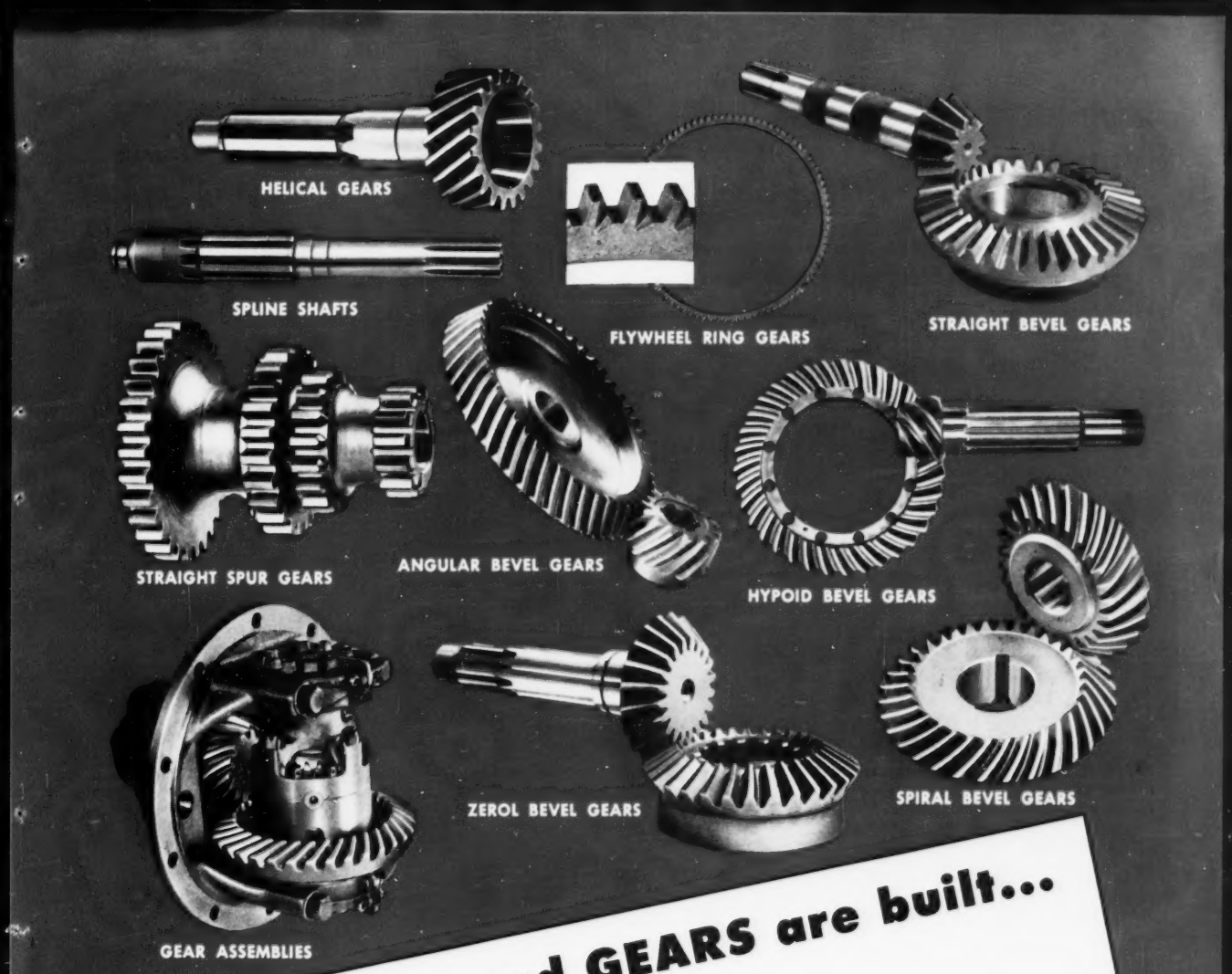
CUSTOM-DESIGNED . . .

The basic machine is standard, but each mill is tooled for specific work. Because all machine elements are individually motor-driven, the machine can be adapted to a wide range of applications. Write for complete details and your copy of Special Bulletin 2380-C-1312.

GEORGE GORTON MACHINE CO.

1312 RACINE STREET • RACINE, WISCONSIN, U. S. A.

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Double Diamond GEARS are built...

. . . to produce low installed cost

. . . to serve economically and dependably on the job for which you buy them

. . . and to do credit to your product and your reputation



The above quotation appears in the introduction of our new 40-page reference book which fully describes the ten types of gears in which we specialize. If you are interested in gears built to those standards have your secretary write for a copy of the complete catalog.

DOUBLE DIAMOND GEARS
TRADE MARK

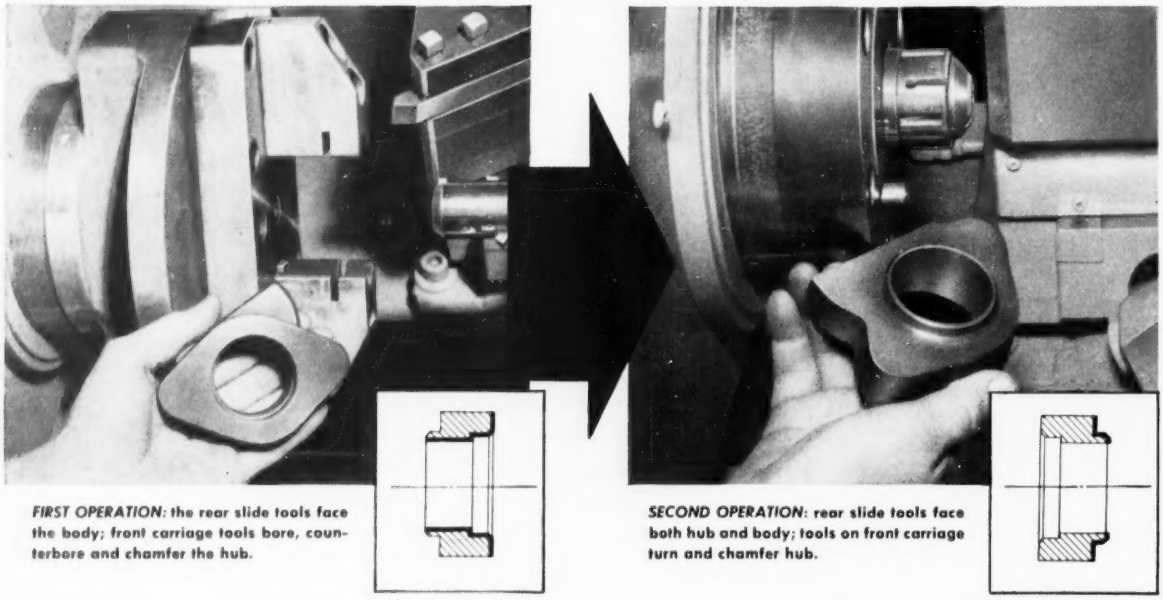
AUTOMOTIVE GEAR WORKS

RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

Quick "pass-along" idea

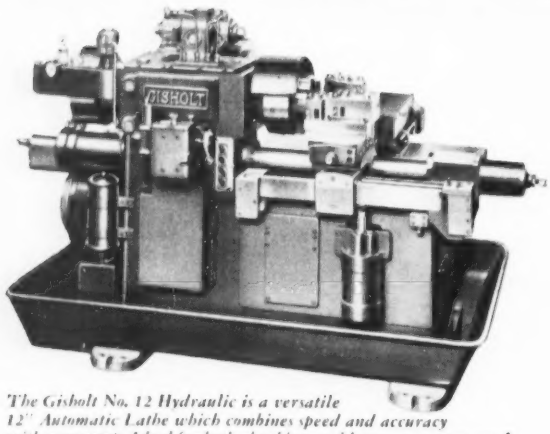
INCREASES PRODUCTION



FIRST OPERATION: the rear slide tools face the body; front carriage tools bore, counterbore and chamfer the hub.

SECOND OPERATION: rear slide tools face both hub and body; tools on front carriage turn and chamfer hub.

with pair of GISHOLT No. 12 Hydraulic Automatic Lathes



The Gisholt No. 12 Hydraulic is a versatile 12" Automatic Lathe which combines speed and accuracy with easy setup. Ideal for both chucking and between-centers work.

One operator with two standard machines now handles these cast iron manifold bodies in rapid succession—at a pace of 80-per-hour, at 80% efficiency.

This two-machine team pays off many ways: The operator loads and unloads one machine while the other is working—*automatically.* Investment is at a minimum because both machines *and* tooling are standard. Tool setups and replacements are simple.

Whether you have continuous runs like this or even smaller job lot work—the speed and automatic operation of the Gisholt No. 12 Hydraulic may be your answer to lower costs. It's worth investigating.

570

GISHOLT

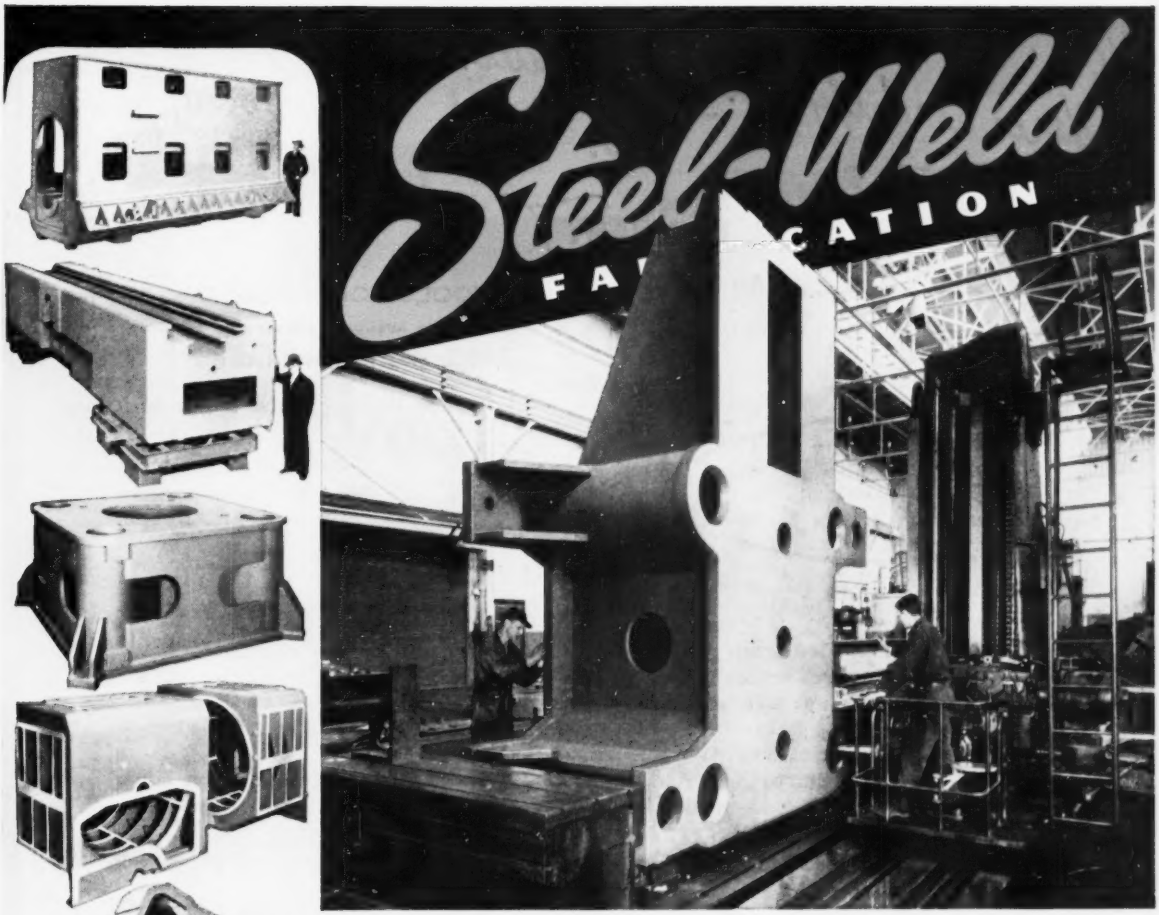
THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*



GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

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Use WELDED STEEL for Greater Strength with Less Weight!

The forty ton Press Platen above, and the parts and assemblies illustrated at the left, are typical of thousands of Steel-Weld Fabricated units produced and machined by Mahon for hundreds of manufacturers of heavy machines and other mechanical equipment. If parts of your product could be redesigned and produced to better advantage through Steel-Weld Fabrication, or, if you require a limited number of large heavy pieces in which pattern costs are a consideration, you can turn to The R. C. Mahon Company with complete confidence . . . personnel and facilities are available within the Mahon plant to do the complete job from drawing board to finished machining. You will find in the Mahon organization a unique source with complete ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or write for further information.

THE R. C. MAHON COMPANY

DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

H. J.
Here's a really fantastic letter!
P.W.

BANNER TOOL COMPANY

BANNER tools DETROIT — *Fine* TOOLS FOR INDUSTRY

7343 FILER AVENUE - TWINBROOK 2-4900

DETROIT 12, MICHIGAN

June 16, 1952

Cities Service Oil Co.,
3049 E. Grand Blvd.,
Detroit 2, Michigan
Attention: Mr. P. E. Watts

Dear Sirs:

We called upon the services of your lubrication engineer, Mr. A. J. Blake, in reference to a serious staining condition which we were having with our soluble oil. He analyzed this condition and recommended one of your Chillo Oils. This oil was tried and the rust condition eliminated to our satisfaction.

To our surprise on his next visit he was dissatisfied with our tool life and suggested we use a soluble oil called "Chillo A". Now not only do we have clean machines, but tool life has been increased 20%! While in our plant he asked permission to "look around", which, of course, was granted.

We were using a tapping compound with precision ground taps in order to hold to close tolerances. We did not consider tap breakage excessive but the removal of broken taps was sometimes rather expensive. He recommended we use "Chillo 10Z". Then came the surprise of our lives! With Chillo 10Z we have gone to commercial ground taps (a 300% savings) and can still hold our same tolerances, with a sharper thread, increasing tap life a minimum of 20% plus eliminating expensive removal of broken taps!

We also have a production stamping job which required a new set of dies every month. On his recommendation we tried Chillo 10Z with these dies. Now our die life has increased to at least two months...a saving in die life of 100%, disregarding labor costs. We also increased production 200% per die sharpening!

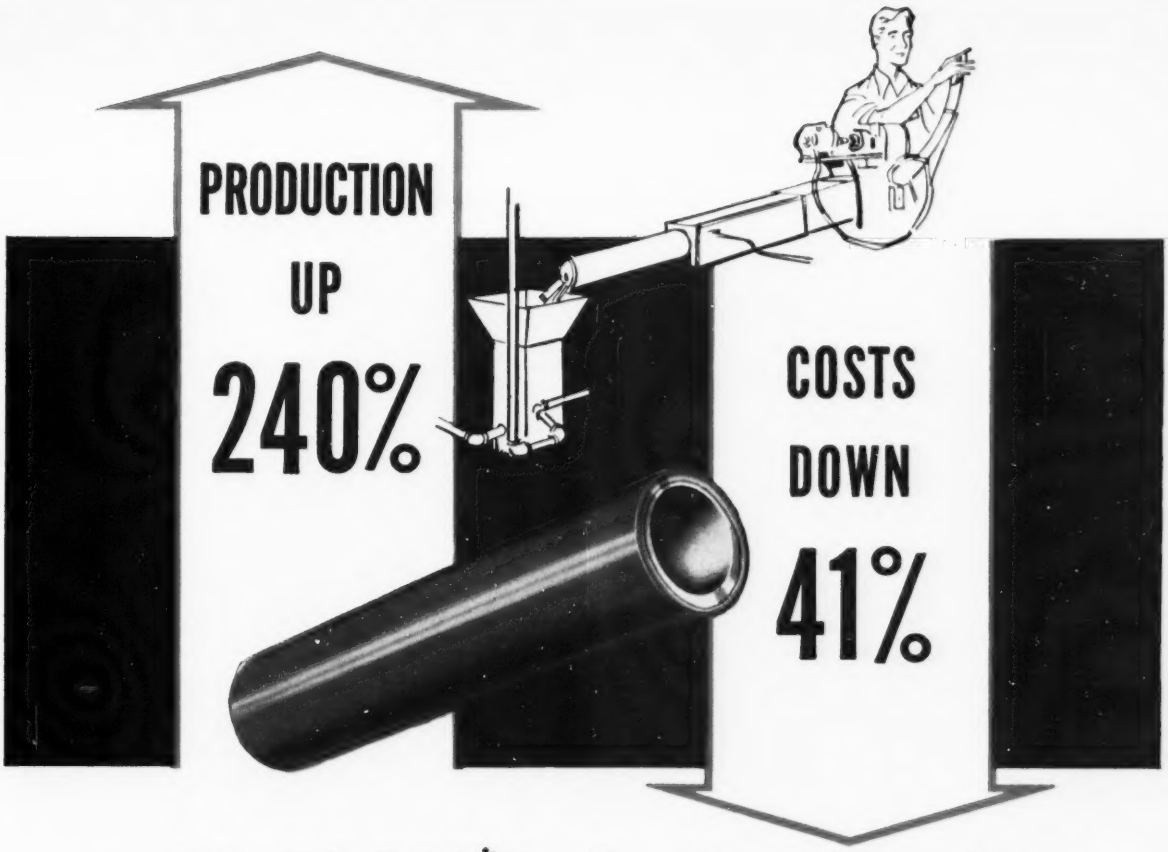
We tried the same oil on our broaching operation and found that instead of making two cuts we can get the same results now with one. We were using one of your competitors' hydraulic oils and you told us it was a "good oil" and would give us satisfactory performance. BUT, GENTLEMEN, WITH THE EXCELLENT SERVICE YOU HAVE GIVEN, PLUS THE TIME AND MONEY SAVED, YOU MAY REST ASSURED THAT ALL OF OUR LUBRICATING REQUIREMENTS WILL BE PURCHASED FROM YOU.

Yours very truly,
BANNER TOOL COMPANY

S. F. OLESAK

SFO:sd

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with TOCCO* Induction Heating

Whether you're interested in upping production or downing costs—or both—it pays to investigate TOCCO Induction Heating if you heat-treat, anneal, braze, solder, forge or melt ferrous or non-ferrous metal parts.

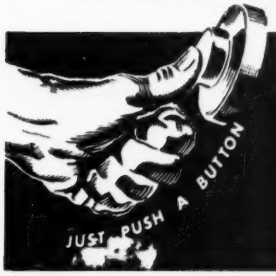
PRODUCTION UP—When Thompson Products Ltd., St. Catharines, Ontario switched from conventional methods to TOCCO Induction Hardening of their automotive wrist pins, production rose from 500 to 1200 per hour.

COSTS DOWN—While production jumped, costs fell from $5.46 per hundred parts to $3.23—a savings of more than 2c per pin or $26.76 per hour on the hardening operation alone.

OTHER ADVANTAGES—Additional savings result from elimination of hauling wrist pins to and from the heat-treat department. Cool, clean TOCCO fits right in the production line, next to related operations—takes only ¼ the space of the pusher-type furnace previously used.

In Canada or the United States TOCCO engineers are glad to survey your operations for similar cost-cutting results—no obligation, of course.

THE OHIO CRANKSHAFT COMPANY



TOCCO

*Trade Mark Reg. U. S. Pat. Off.

Mail Coupon Today

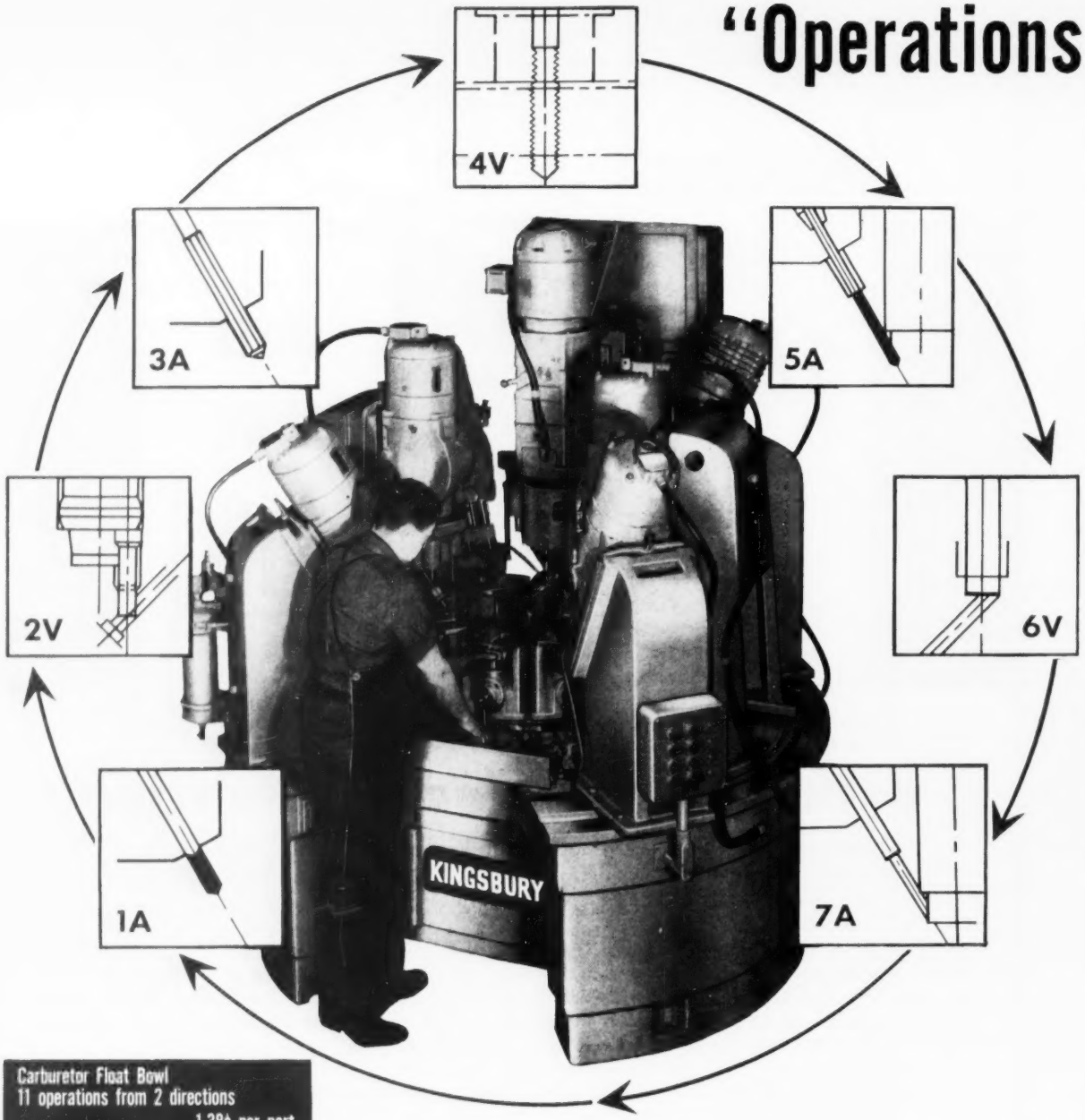
NEW FREE BULLETIN

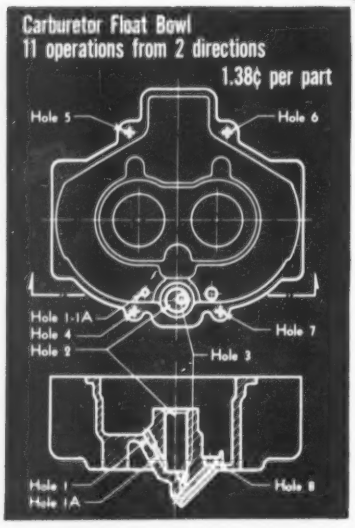
THE OHIO CRANKSHAFT CO.
Dept. M-12 Cleveland 1, Ohio

Please send copy of "Typical Results of TOCCO Induction Hardening and Heat Treating".

Name_____
Position_____
Company_____
Address_____
City_____ Zone____ State____

"Operations





Watch this Kingsbury drill, ream,

. . . at the rate of 55.9 operations every minute!

It works on a Carburetor Float Bowl (zinc-alloy die casting) operating on 7 vertical and 2 angular holes. It produces 305 parts per hour gross, at a cost of 1.38c per part.

This Kingsbury machine was custom-built to do a high production — low cost job on this particular piece. Four angle (A) and three vertical (V) units, operating 10 spindles, are mounted on a 60 inch base. Eight work fixtures (one for unloading and loading) are mounted on a 30 inch index turret, which indexes through the seven work stations in approximately 44 seconds. During this cycle the machine performs 11 precision operations, including broaching.

Let's follow through a work cycle — and remember this can go on day after day, year after year, producing accurate parts at low cost.

Kingsbury" all count up for profit

Let's look at these four machines

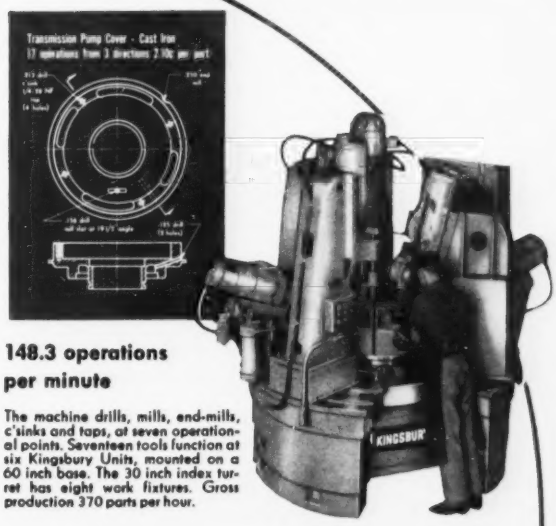
Combining operations makes it possible to perform more work in a given period of time.

On a Kingsbury Machine the tools at each station perform one or more of the required operations within a set time interval. The object is to perform all required work on the piece in one chucking within one cycle through the machine.

A single piece may be worked upon by different tools from several directions simultaneously. Everything except loading and unloading is controlled automatically — the machine takes over completely, carrying the work from station to station until the part is finished to specifications.

You save — because one machine does the work of several, with one operator, one chucking . . . and a high standard of accuracy that practically eliminates scrap loss. *You gain* through greater and more uniform output.

Kingsbury Machine Tool Corp.
104 Laurel Street, Keene, N. H.



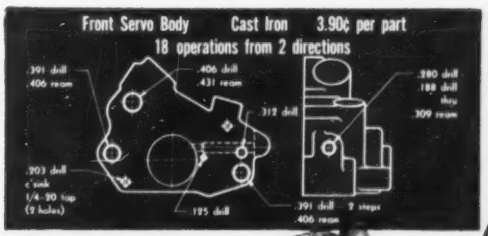
148.3 operations per minute

The machine drills, mills, end-mills, c'sinks and taps, at seven operational points. Seventeen tools function at six Kingsbury Units, mounted on a 60 inch base. The 30 inch index turret has eight work fixtures. Gross production 370 parts per hour.



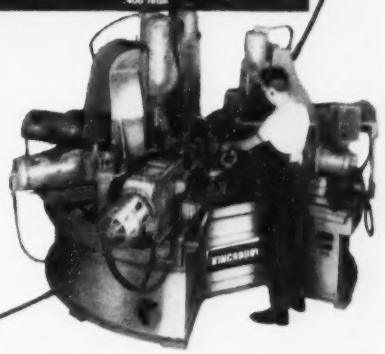
51.0 operations per minute

The machine drills equally-spaced holes in a bolt circle slightly over 12 inches diameter. One vertical Kingsbury Unit with multiple spindle head operates 6 drills. The work fixture indexes five times to produce 30 holes — then moves to free the work for unloading and loading. Gross production 102 parts per hour.



63.3 operations per minute

The machine drills, reams, c'sinks and taps at eight operational points. Eighteen tools function at seven Kingsbury Units mounted on a 100 inch base. The 20 inch index turret has eight work fixtures. Gross production 211 parts per hour.



seat, burnish, broach and tap

Unit 1A .136 drills Hole 1 at 60° angle, 1/8 inch deep.

Unit 2V operates on cored Holes 2 and 3. It has a combination burnishing and broaching tool attached to the quill of the drill head. Spindle is eliminated. Feed mechanism of drill head forces tool downward. It .625 burnishes Hole 2 to a depth of 1 inch and .125 broaches Hole 3 to a depth of 3/8 inch. Hole 3 is located .1875 off center line of Hole 2.

Unit 3A .1375 reams Hole 1.

Unit 4V has a four spindle auxiliary drill head; taps Holes 4, 5, 6, 7 (10-32 NF Taps).

Unit 5A .057 drills Hole 1-A at same 60° angle, 5/8 inch deep.

Unit 6V .250 burrs intersecting hole at bottom of Hole 8.

Unit 7V .136 burrs flat bottom seat in Hole 1.

One operator loads and unloads.

Each Unit Cost on the drawings includes the cost of the man and of the machine — no power or overhead. We assumed:

Unit cost of man equal to:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% eff.}}$$

Unit cost of machine to be:

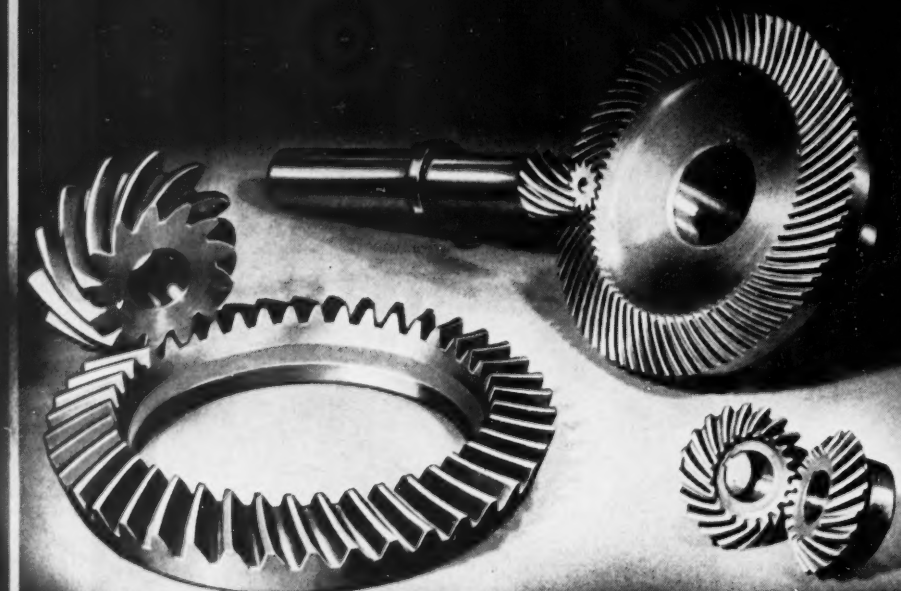
$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. @ 80\% eff.}}$$

KINGSBURY

AUTOMATIC DRILLING AND TAPPING MACHINES
for Low-Cost High Production

PHILADELPHIA

Spiral-Bevel GEARS



We cut all sizes.

Philadelphia Spiral-Bevel Gears provide a smooth, quiet and dependable means of right angle power transmission. They are precision made on the most modern gear cutting machines and finished to your exacting specifications. Sizes up to 48 inch diameter. Straight and Curved Tooth, Zerol and Hypoid Spiral Bevels can be supplied. Order Philadelphia Spiral-Bevel Gears.

PHILLIE GEAR®

Spur	Herringbone	Spiral Bevel
Helical	Worm	Zerol
Spur Internal	Non-Metallic	Hypoid
Helical Internal	Spline-Shafts	Intermittent
Racks	Coniflex-Bevel	Sprockets

Philadelphia Gear Works, INC.



ERIE AVE. AND G ST., PHILADELPHIA 34, PA.

NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

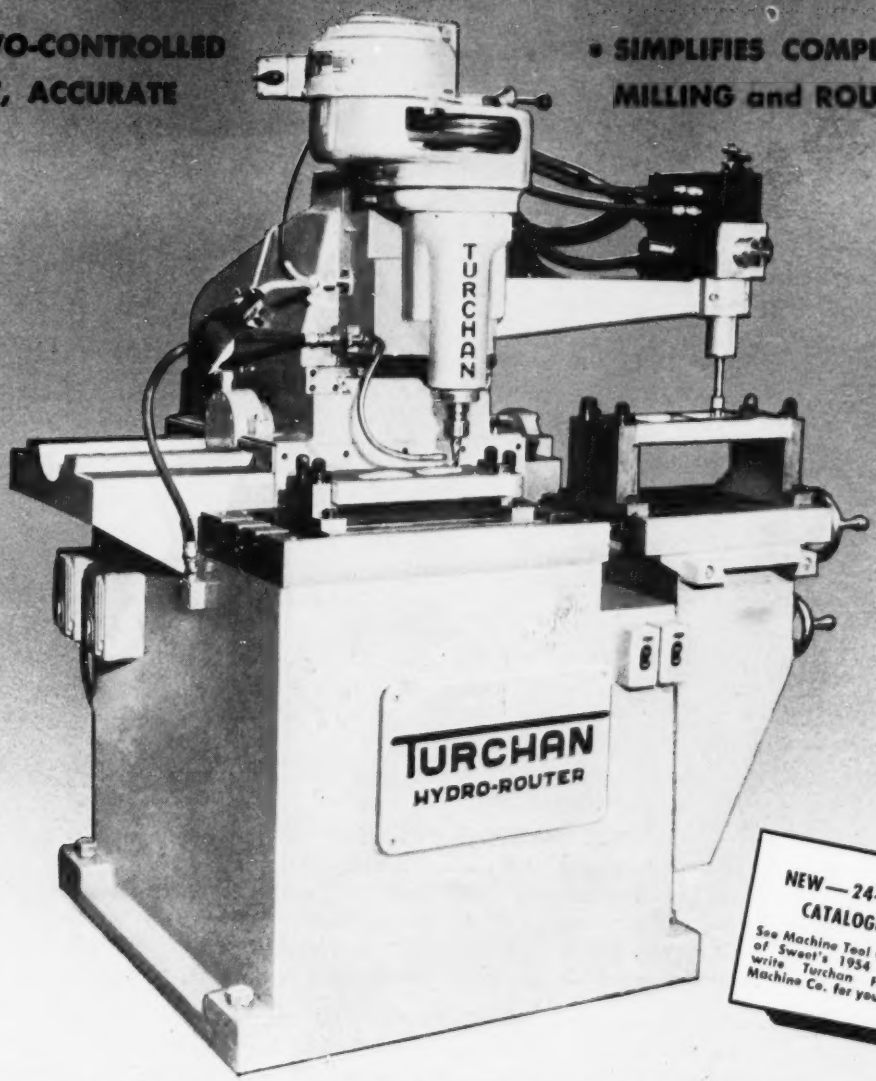
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NEW—3-DIMENSIONAL!

Turchan HYDRO-ROUTER

• SERVO-CONTROLLED
• FAST, ACCURATE

• SIMPLIFIES COMPLEX MILLING and ROUTING



NEW—24-PAGE CATALOGUE
See Machine Tool Catalogs of Sweet's 1954 File or write Turchan Follower Machine Co. for your copy.

Greater sensitivity, accuracy and increased duplicating speed result in hours of costly time saved on irregular forms and parts with Turchan's new Hydro-Router. Controls are grouped within easy reach of operator; virtually eliminating fatigue. Infinitely variable 3-dimensional tracer-control of vertical, cross and longitudinal spindle movements produces a superior finish at extreme accuracy of duplication. Turchan Hydro-Routers available in many sizes; each with a wide range of speeds and feeds. Write for full information.

Turchan FOLLOWER MACHINE CO.

Machine Tools Division, 8259 Livernois Avenue, Detroit 4, Michigan

For 20 years, designers and builders of automatic hydraulic tracer-controlled equipment for standard machine tools and special machines



Takes on all comers!

This 42-72-84 Blanchard Surface Grinder is used for machining many sizes of torch cut steel plates. As the first operation after cutting, Blanchard grinding removes the proper depth of stock as required, frequently up to ⅛" per side, producing surfaces accurately flat and parallel for laying out or further machining. Work up to 7 feet across corners is regularly ground on this machine. In spite of its size, this grinder is as easily controlled as the smaller Blanchard grinders.

Typical of work produced is the 48" x 48" x 10" machine steel, die mounting plate, at left. 58 cu. in. of stock (.025" per side) is ground off in one hour and 35 minutes, floor to floor, with flatness held to .001". Note the magnetic hoist —a good tip for loading and unloading the Blanchard quickly.

Regardless of your requirements for stock removal, tolerances or surface finish, Blanchard has the grinder and grinding wheel to do each job best.



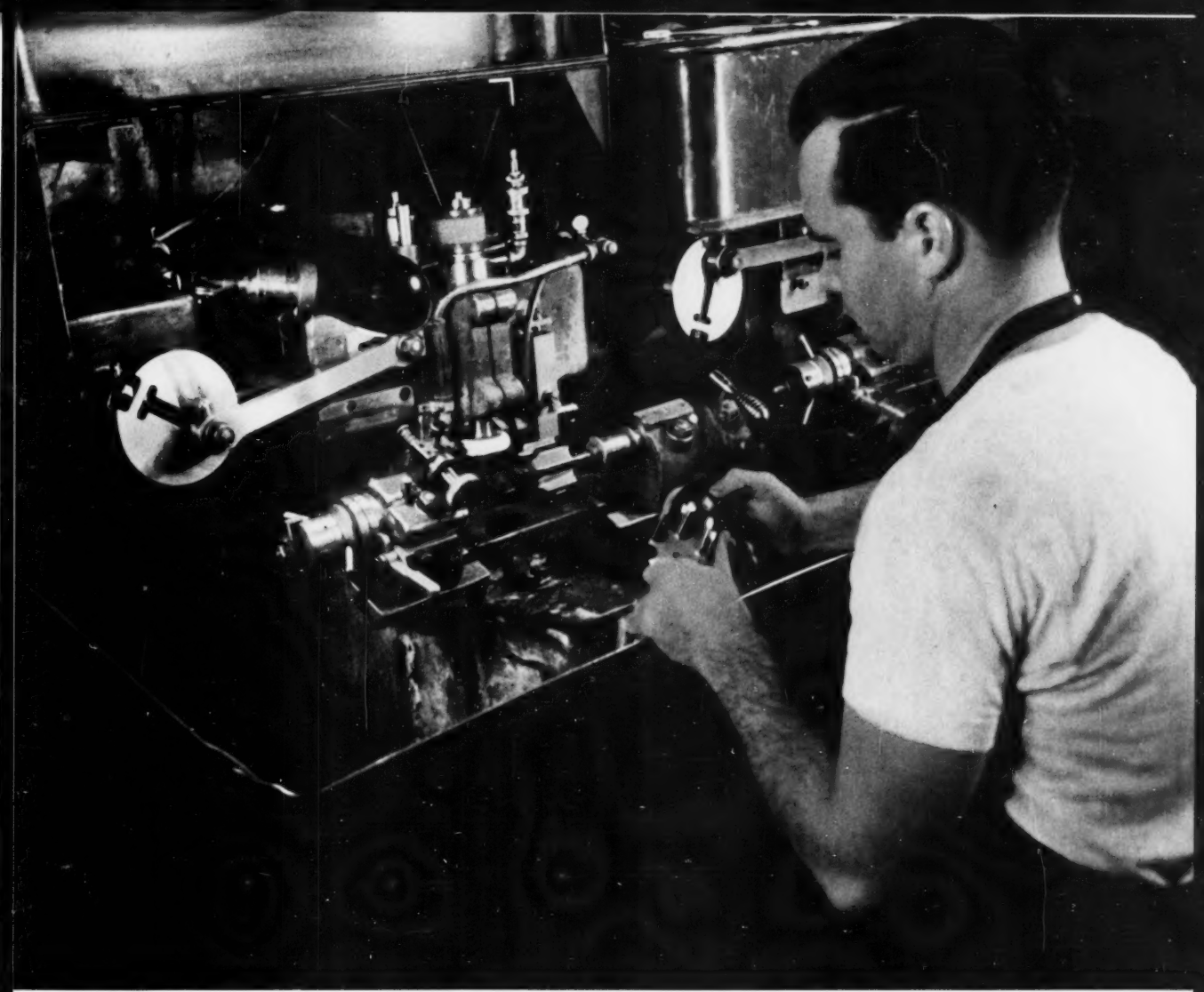
Send for your free copies of "Work Done on the Blanchard," fourth edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

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Machine Ground Tap Flutes

Grinding Tap flutes is not just another operation to improve their appearance. Like Greenfield's precision automatic chamfering, this machine grinding operation imparts one more feature that makes "Greenfield" Taps TOPS.

Why? Because it assures accurate spacing and uniform cutting faces down to the very end of the tap. And the ground flute surfaces provide better chip slippage and disposal.

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachssetts



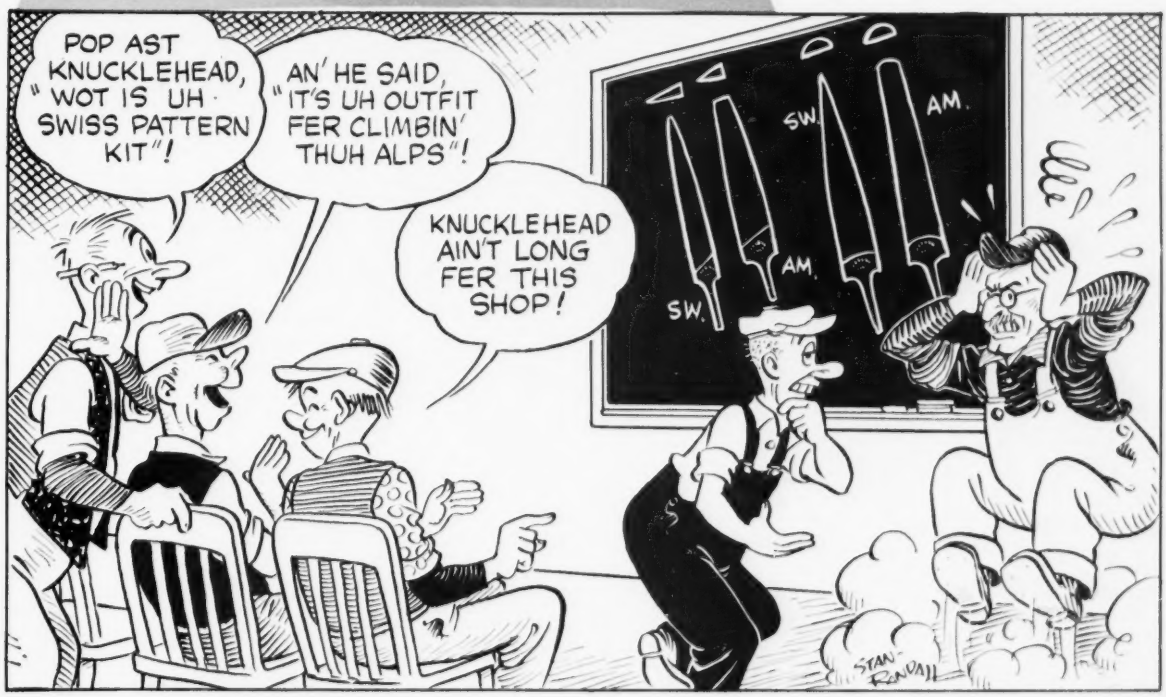
BUY GTD GREENFIELD!

GEOMETRIC TOOL COMPANY DIVISION

Greenfield Tap and Die Corporation

NEW HAVEN 15, CONNECTICUT

POP'S school of Filing



Precision work is the main purpose of Swiss Pattern files, and their uses have been expanding year after year. Tool, die and model finishing, instrument assembling, slot rounding and bur removals from drilling and machining operations are among their widest fields.

Nicholson is considered today's foremost manufacturer of such files. Shapes, cuts and sizes are almost legion. Measurements are more exacting than in American patterns. Points are smaller; tapers are longer.

Because of their *extra fine* quality and workmanship, Nicholson Swiss Patterns are appropriately trademarked X.F. They are the handicraft of specially trained file cutters working in a separate section of the Nicholson factory.



ASK YOUR INDUSTRIAL DISTRIBUTOR

for any of these NICHOLSON X.F. Swiss Pattern file types or groups: Round and Square Handle Needle files (in plastic-box kits of 12 assorted shapes and choice of 3 lengths and 4 cuts); Die Sinkers files; Die Sinkers and Silversmiths Rifflers; Filing Machine files. Individual Crochet, Barrette, Slitting, Crossing, Pippin, Joint, Screw Head, Warding, Equaling, Corrugating, Pillar Testing, Round, Flat, Square, Three Square, Knife —and many others.

TRADE X.F. MARK

For free book, "FILE FILOSOPHY," *write to*

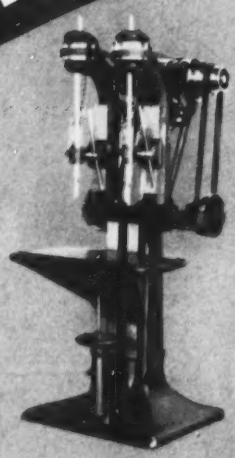
NICHOLSON U.S.A.

NICHOLSON FILE CO. • 18 ACORN ST. • PROVIDENCE 1, RHODE ISLAND

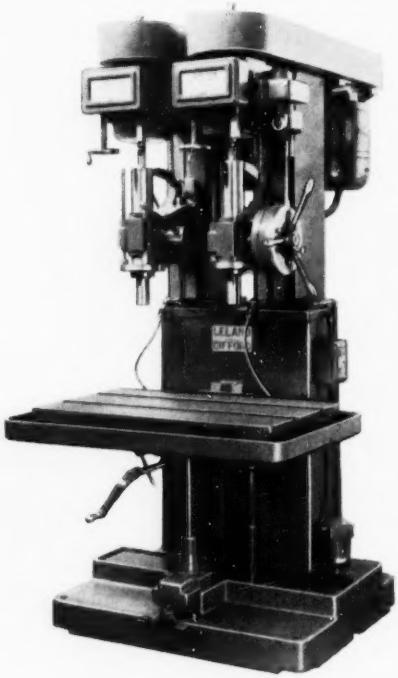
(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON ... A FILE FOR EVERY PURPOSE

The Big Difference is in your PROFIT!



1913



1953

You can see at a glance that the new Leland-Gifford Drilling Machine is equipment any shop would be proud of — inspiring operators to do their best and lending a look of modern efficiency to the plant.

Heavier and more rugged than the old drilling machine; it has individual motor drive in place of the belt drive; radial and annular thrust bearings instead of plain thrust bearings, oil mist lubrication replacing open lubrication and multi-spline spindles where single spline spindles were used.

But the big difference is in your profit. Today's pace demands faster production and greater accuracy. Modern Leland-Gifford Drilling Machines have what it takes not only to keep you ahead today, but to enable you to operate at a profit in the face of even higher standards which may be expected tomorrow.

Write For Complete Information



LELAND-GIFFORD

Drilling Machines

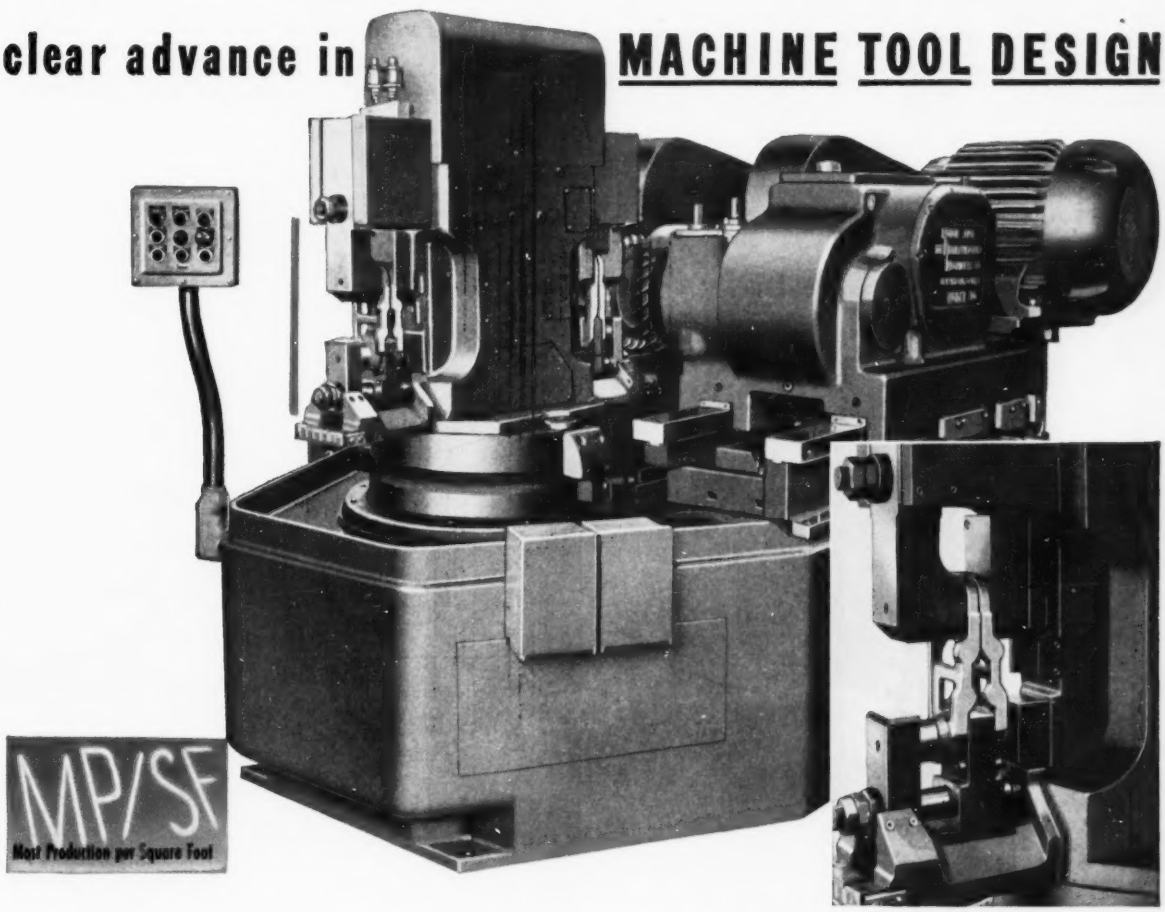
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Every time—count upon

MOTCH & MERRYWEATHER Engineering for a

clear advance in MACHINE TOOL DESIGN



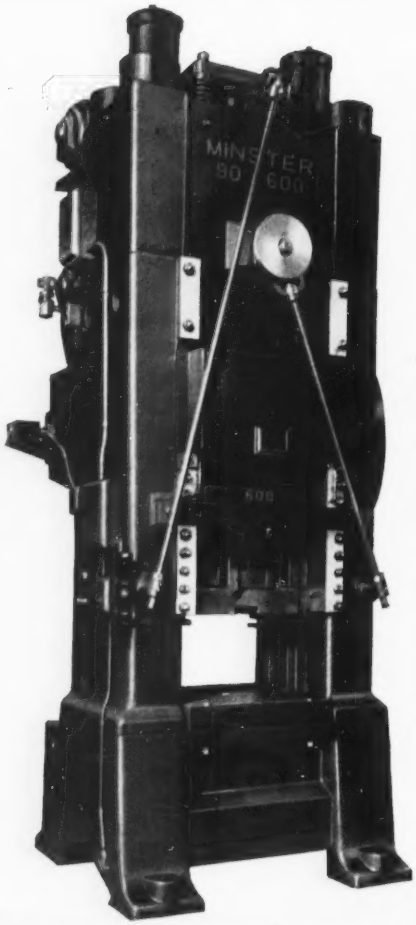
Each machine tool built by us is charged with doing a specific job better than before and for less. To us that is a privilege—a challenge—an obligation. Every machine developed by the Motch & Merryweather engineering staff must earn a permanent place for itself in Industry—must contribute permanently to a nation's advance in point of efficiency and economy—must mark a visible step forward in machine tool design and construction . . . An example is outlined on this page.

This M & M duplex production single-purpose milling machine mills two tractor side bars while two others are being loaded (removing at same station). Actually mills 70% of the time; up to 268 side bars per hour @ 100%. Two heads move, not the operator. Rigidity and power (30 h.p.) hike output. Fixtures to suit.

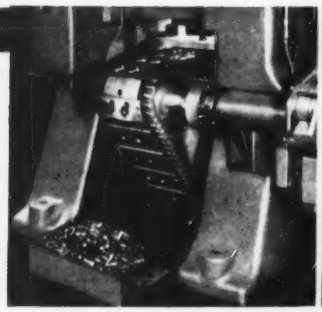
Manufactured by — THE MOTCH & MERRYWEATHER MACHINERY CO. —
CLEVELAND 13, OHIO
Builders of Circular Sawing Equipment, Production Milling, Turning and Special Machines

PRODUCTION-WITH-ACCURACY MACHINES AND EQUIPMENT

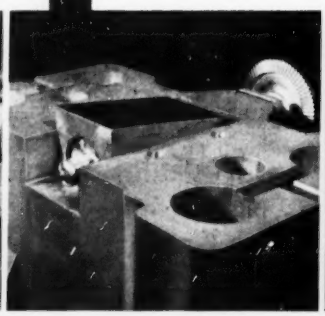
RUGGEDNESS...you



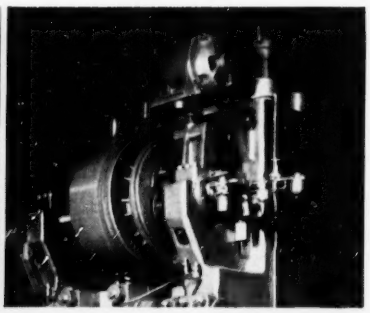
■ One of the basic reasons Minster presses have rung up such outstanding performance records is their unusual ruggedness. Engineered into every Minster is the extra strength, extra rigidity needed today for fast, accurate, vibration-reduced press operation. From the massive main frame down to smallest control box mounting a Minster press has what has come to be called "Minster stamina".



■ Everything about a Minster is rugged. This rear view of a knuckle-joint coining press with continuous chain feed shows the massive frame and heavy-duty feed mechanism.

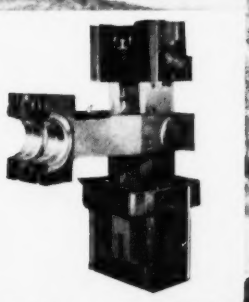


■ Another example of Minster press ruggedness . . . massive, accurately machined adjustment wedge for knuckle-joint presses. Can't be forced from machine.



■ Minster combination friction clutch and brake . . . most compact, rugged, efficient unit of its type ever built. Perfect press control . . . trouble-free press operation.

get it with a Minster Press



■ Famed Minster [illegible] assembly . . . pressure lubri- cated . . . replaceable wear- ing surfaces . . . special bushings . . . heavy steel members.

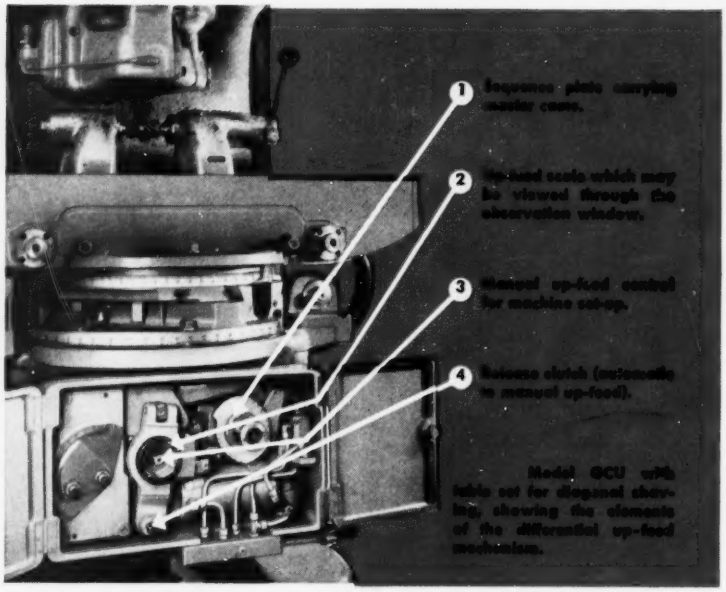
MINSTER

FIRST IN PRESS DESIGN

THE MINSTER MACHINE CO.
MINSTER, OHIO

GEAR SHAVING NOW

Much Faster and More Flexible

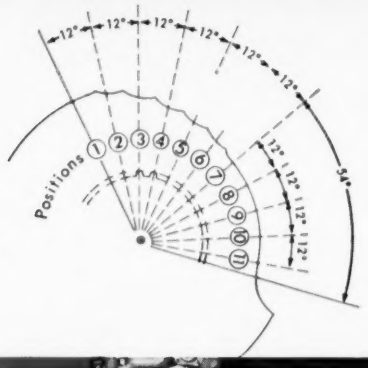


When Automatic Differential Up-feed and Conventional Crowning were added to the Red Ring Model GCU, shaving speed, flexibility and economy were all significantly increased.

AUTOMATIC DIFFERENTIAL UP-FEED

This efficient device provides for the first time an automatic cycle applicable to both diagonal and conventional shaving. This cycle is controlled by an eleven-position master cam. Included are backlash take-up, infeed cutting strokes, idling strokes and return to unloading backlash. The entire cycle or any portion of it may be used depending on job requirements.

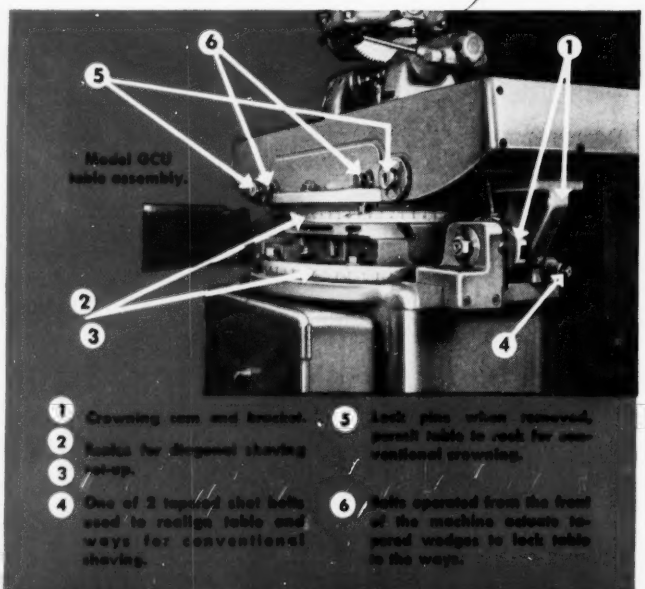
The cam itself does not actuate knee movement. It is strictly a stepped gaging device. Consequently every knee movement is positive, extremely precise and very fast. No danger of operator's errors. Perfect accessibility for fast loading and unloading.



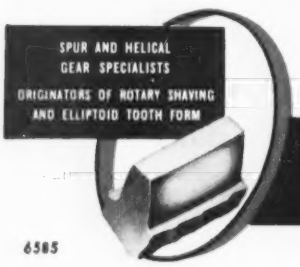
One of the two control cams carried by the feed unit sequence plate.

CROWNING

Gears being shaved conventionally can be crowned by rocking the table about a central pivot during the automatic cycle. The cam controlling the rocking movement is located on table centerline to avoid any tendency to twist. This device also provides for taper shaving.



Write for Bulletin S53-7 for full details.



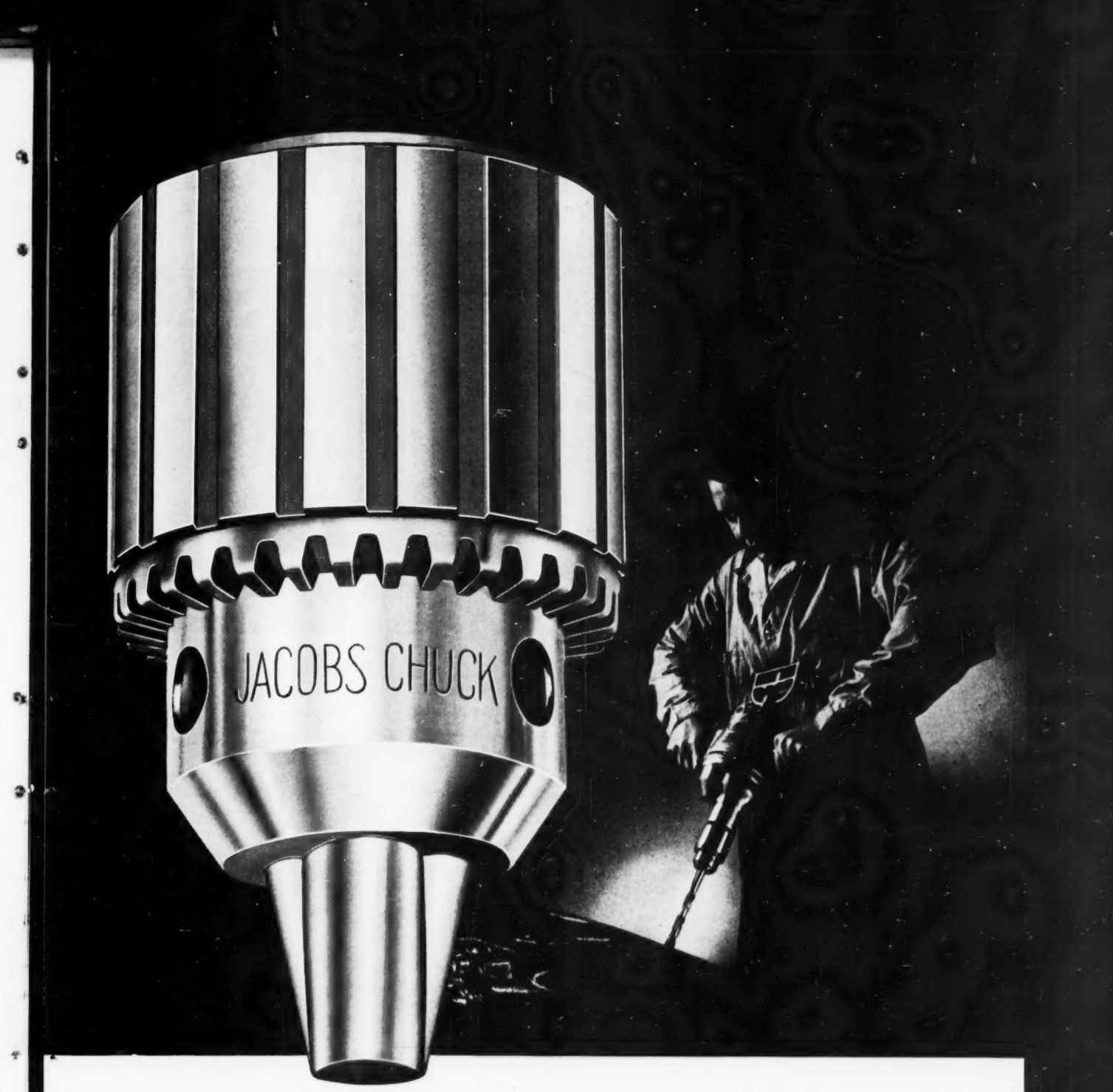
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5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

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TIGHTEN YOUR GRIP ON PRODUCTION

Production flows faster and smoother when your machine tools are equipped with Jacobs Chucks.

Rugged construction, great gripping power and accuracy have made The Jacobs Plain Bearing Drill Chuck the choice of machinists throughout the world.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A JACOBS IT HOLDS

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are ready to deliver the chucks you need and the service you deserve.

. . . first in chucks

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In die cushions, too, BLISS builds more types and sizes than any other company...



Bliss-Marquette Die Cushion Engineering Ranges from Standard "A" and "C" Types for Punch Presses to large Specials like this Hydro-Pneumatic

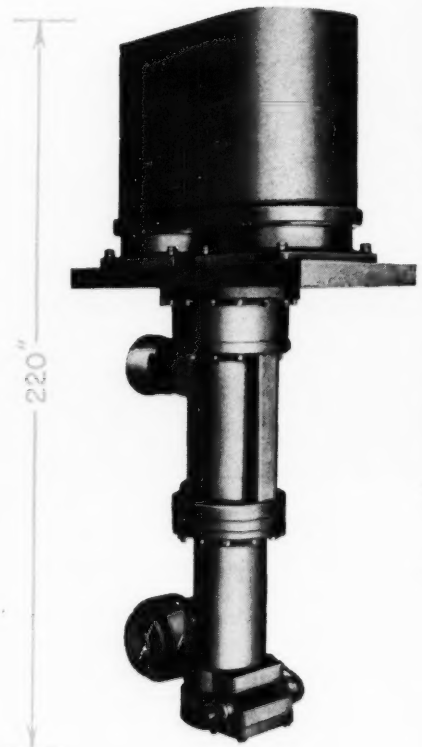
The *right* die cushion for a given application can make a lot of difference in press operation. That's why Bliss engineers have created a multitude of types and sizes to suit individual situations. Bliss designs have demonstrated their effectiveness over many years by...

- ***Permitting deep draw operations at low cost***
- ***Eliminating operations***
- ***Prolonging die life***
- ***Reducing spoilage***
- ***Preventing excessive strains***
- ***Adding another action to presses***

Since these cushions can eliminate many difficulties and make possible substantial savings, *all Bliss S-1, S-2 and Inclinable presses are designed and machined to accommodate them*. Bliss cushions are easy to install, easy to maintain and easily adjusted for work involving any pressures within their capacities.



Bliss builds die cushions in a large number of types and sizes to meet practically any possible condition. You're likely to find the cushion to suit your particular need in Bliss' 60-page Reference Book on types, uses and care of die cushions. Write for your copy.



E. W. BLISS COMPANY, CANTON, OHIO

E. W. Bliss (England) Ltd., Derby, England

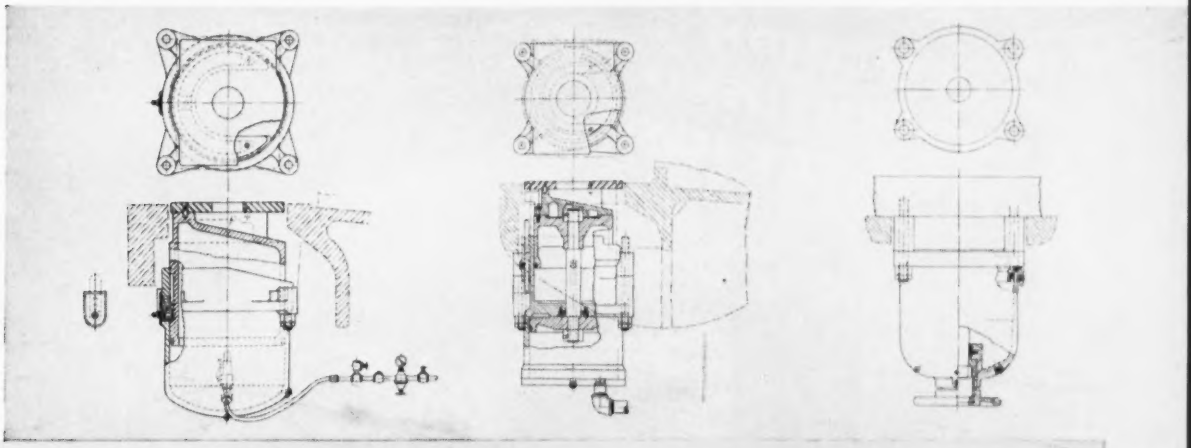
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

U. S. Plants in Canton, Salem and Toledo, Ohio; and Hastings, Michigan
Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Co., Los Angeles and San Francisco; Star Machinery Company, Seattle. Other dealers in United States cities and throughout the world.

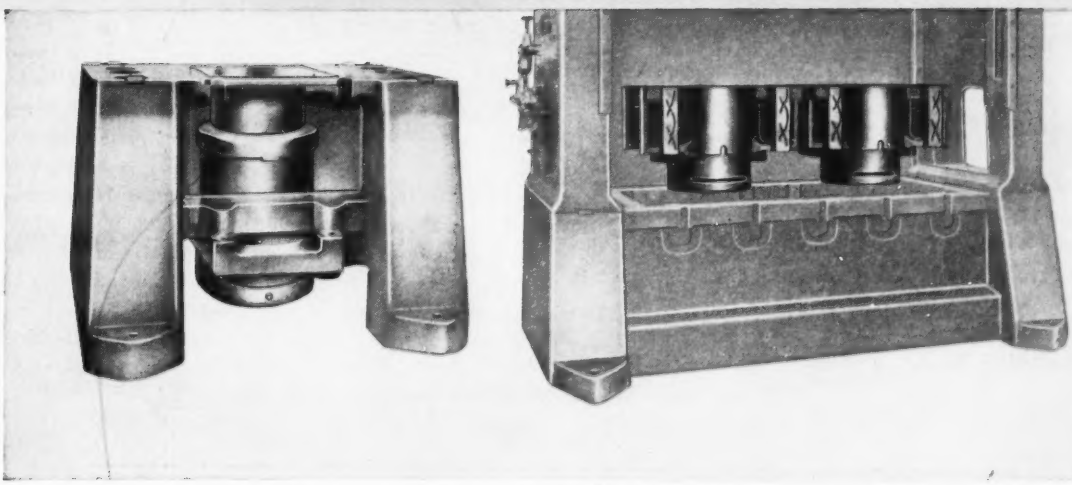
Remember: **for DIE CUSHIONS, Presses,**

FOR INCLINABLE PRESSES Bliss makes a complete series of pneumatic cushions; Type CO (left), requiring no tank for standard strokes; Type CCO (center), requiring a tank only when stroke is over 2", similar to Type CO but with two pistons and cylinders to deliver greater pressures; Type GA (right), having a hollow piston shaft for easy slug removal, self-contained for strokes up to 1".

Note that Type CO and CCO cushions are arranged with openings in the pressure pad to suit the job so that slugs or scrap may be dropped through the die.



Why these Bliss-Marquette Die Cushions for inclinable and straight side presses can improve press room efficiency

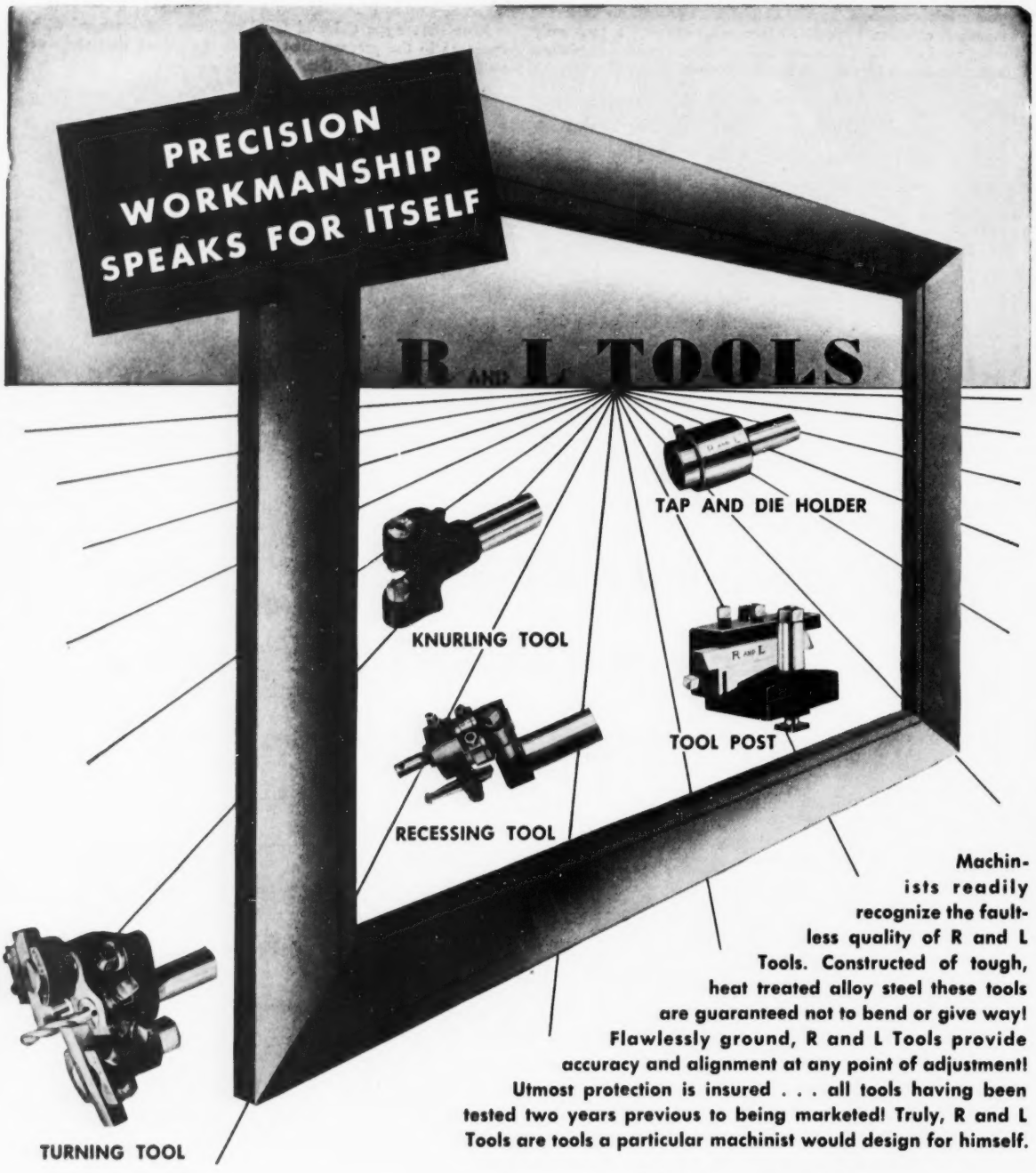


FOR S-1 PRESSES Bliss recommends Type CC cushions which feature extra long internal guides to prevent side movement or weaving of the pressure pad. Locking devices can be furnished.

FOR S-2 PRESSES Bliss recommends Types C and CC cushions. The compact design of Type CC permits installation of a double cushion that will draw up to 8".

Rolling Mills, Special Machinery . . .

It's Bliss



Machinists readily recognize the faultless quality of R and L Tools. Constructed of tough, heat treated alloy steel these tools are guaranteed not to bend or give way! Flawlessly ground, R and L Tools provide accuracy and alignment at any point of adjustment! Utmost protection is insured . . . all tools having been tested two years previous to being marketed! Truly, R and L Tools are tools a particular machinist would design for himself.

Write for complete catalog

R and L TOOLS

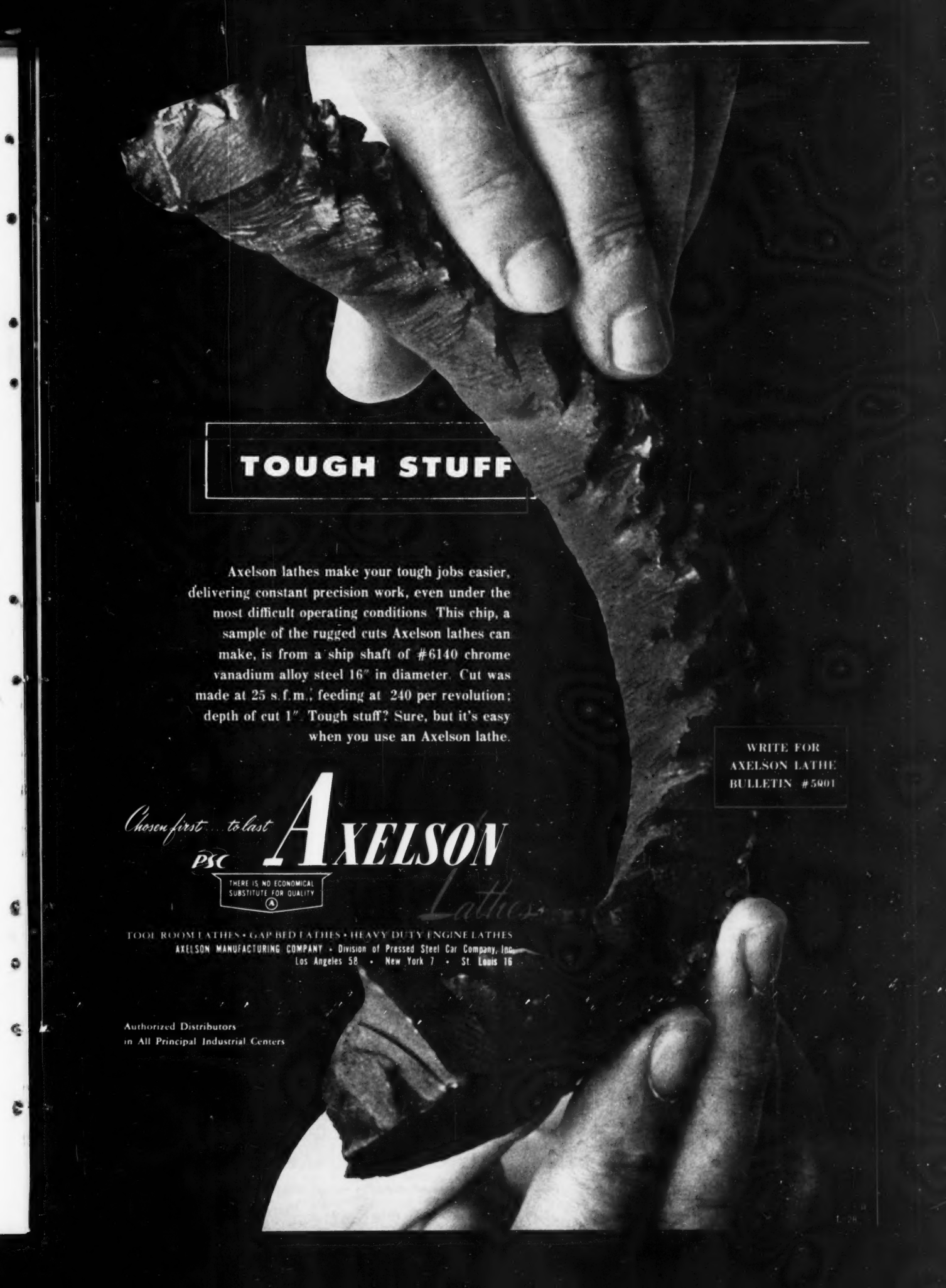
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1825 BRISTOL STREET • PHILADELPHIA 40, PA.

Manufacturers of Precision Screw Machine Tools

TURNING TOOL • TAP AND DIE HOLDER • UNIVERSAL TOOL POST • TURRET BACKREST HOLDER • CUT-OFF BLADE HOLDER • RECESSING TOOL
RELEASING ACORN DIE HOLDER • REVOLVING STOCK STOP • FLOATING DRILL HOLDER • KNURLING TOOL • CARBIDE AND ROLLER BACKRESTS

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TOUGH STUFF
Axelson lathes make your tough jobs easier, delivering constant precision work, even under the most difficult operating conditions. This chip, a sample of the rugged cuts Axelson lathes can make, is from a ship shaft of #6140 chrome vanadium alloy steel 16" in diameter. Cut was made at 25 s.f.m., feeding at .240 per revolution; depth of cut 1". Tough stuff? Sure, but it's easy when you use an Axelson lathe.
WRITE FOR AXELSON LATHE BULLETIN #5901
Chosen first ... to last
AXELSON
PSC
THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY
Lathes
TOOL ROOM LATHES • GAP BED LATHES • HEAVY DUTY ENGINE LATHES
AXELSON MANUFACTURING COMPANY • Division of Pressed Steel Car Company, Inc.
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ARMSTRONG





More Tools Per Man for More Profit

Even when labor was cheap and tools were costly, it was the best tooled shops that prospered. Now, with wages higher and the work days shorter, it becomes imperative that every worker be supplied with every tool that will increase his hourly production.

See that each lathe, planer and shaper operator has the correct ARMSTRONG TOOL HOLDERS for each operation he performs. Equip each machine with its full complement of ARMSTRONG Setting-up Tools. Use better balanced, handier ARMSTRONG WRENCHES on machines and assembly lines. Specify ARMSTRONG Drop Forged "C" Clamps and Lathe Dogs . . . Today, only quality tools can be truly economical.

Write for the ARMSTRONG Catalog. It has page after page of production-increasing, cost-cutting tools.

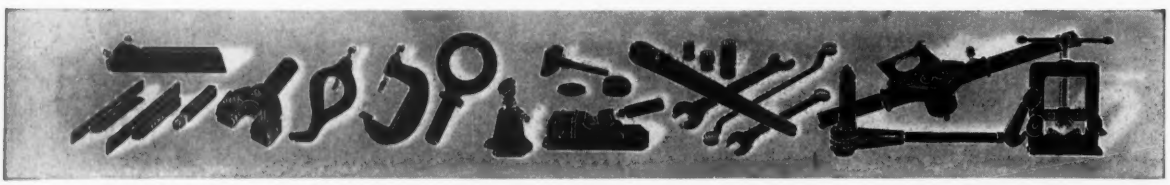
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5213 W. ARMSTRONG AVENUE CHICAGO 30, U.S.A.

New York and San Francisco

Armstrong Tools are Stocked by Industrial Distributors

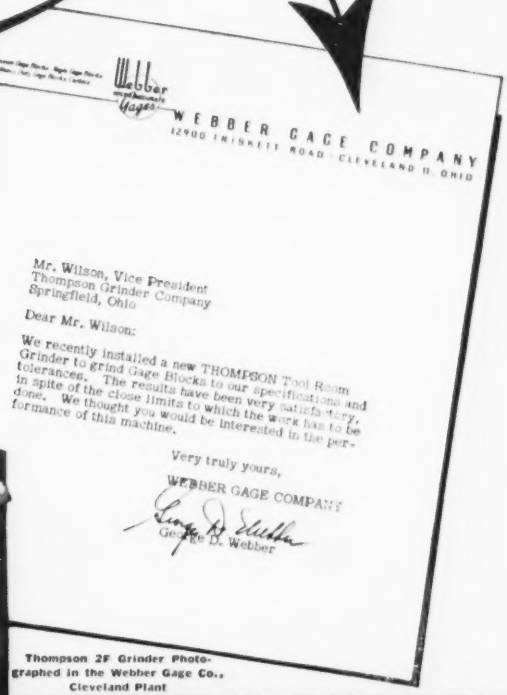


For more information on products advertised, use Inquiry Card, page 247

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder





WEBBER GAGE COMPANY
12900 TRISKETT ROAD · CLEVELAND 11, OHIO

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
George D. Webber

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

COPYRIGHT 1951 BY THE THOMPSON GRINDER CO.

The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

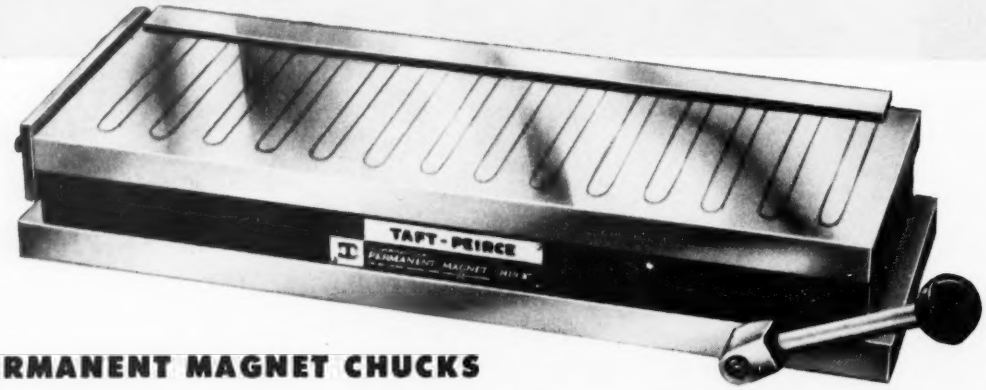
Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

TIPS FROM TAFT-PEIRCE ON:

Selecting a MAGNETIC CHUCK

When it comes to choosing a chuck, look for the one that gives you the *fastest* setups . . . the *safest* setups . . . the *most* setups for any particular job — without constant repairs and replacements. The following comparisons should serve as a useful guide.

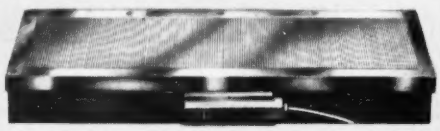


PERMANENT MAGNET CHUCKS

T-P Superpower P-M Chuck. Since it has no wires to fail . . . no current to heat — it's the safest, most economical choice for many jobs. Portable. Versatile. Ideal for grinding, light milling, planing, shaping, and bench work.

A T-P Permanent Magnet Chuck is 15 to 20% lower than other makes, it's stronger, and has a greater working surface.

Available in range of sizes.





RECTANGULAR CHUCKS



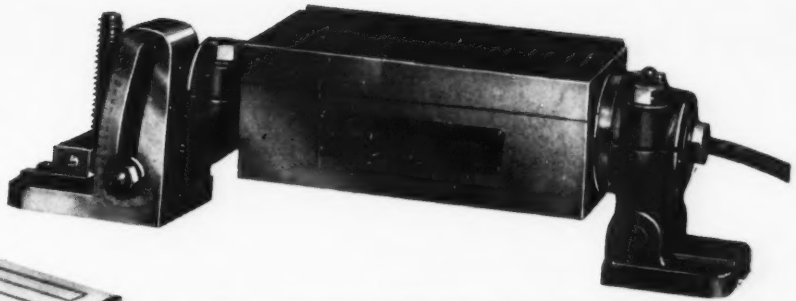
T-P Superpower Magnetic Chucks for greater flux penetration and versatility. Holds a wider variety of sizes and shapes. Permits mounting parts well above the face plate level. All T-P Magnetic Chucks *pack more power* in less space. Increase variety, speed, and safety of setups.

T-P Superpower Fine Mesh Chuck provides finer flux concentration . . . safely secures small or thin sections formerly found impractical for magnetic chucking.

T-P Longitudinal Chuck for wide variety of work. Most versatile yet devised, it handles both large and small sections with equal ease.

Available for all sizes of machine tool tables.

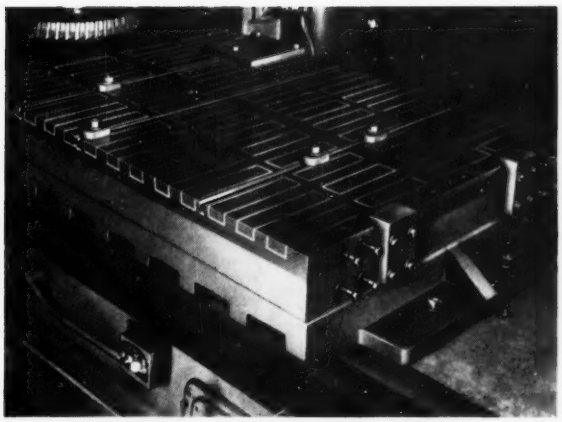
ADJUSTABLE CHUCKS





T-P Superpower Precision Duplex Chuck. Saves setup time when grinding or machining formed tools, simple or compound angles, and dressing carbide-tipped or steel tools. Swivels to 90° on either side of horizontal. Tilts to 14°. Clamps rigidly at any setting.

T-P Superpower Sine-Angle Chuck. Speeds positioning of tricky angle grinding jobs. Gage blocks placed between roll and base plate assure high precision of single or compound angle setups. Many other T-P adjustable chucks are also available.

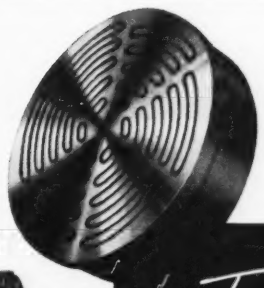


SPECIAL CHUCKS

T-P Superpower Chucks can be custom-built to solve unusual problems. One shown at left is special 55½" x 40", built to hold cast iron loomsides on a 75 HP milling machine — while three 18" carbide cutters and two 4" mills take ¼" cuts simultaneously *at 30" per minute.* Its greater holding power, smaller size, and high efficiency are typical of all T-P Superpower designs — whether special or standard models.

ROTARY CHUCKS

T-P Superpower Rotary Chuck for rotating spindles. Provides greater work range and efficiency than other makes with its greater holding power and compactness. Available in standard sizes. Also with fine mesh face plate for small pieces.





AIR GAGES • FIXED GAGES • TOOL-ROOM SPECIALTIES • MACHINE TOOLS

For full details on these and many more products, get your copy of the Taft-Peirce Handbook.

T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET, RHODE ISLAND

Need low cost, quick assembly, long bearing life?

here's how manufacturers of automotive components get them with NEEDLE BEARINGS

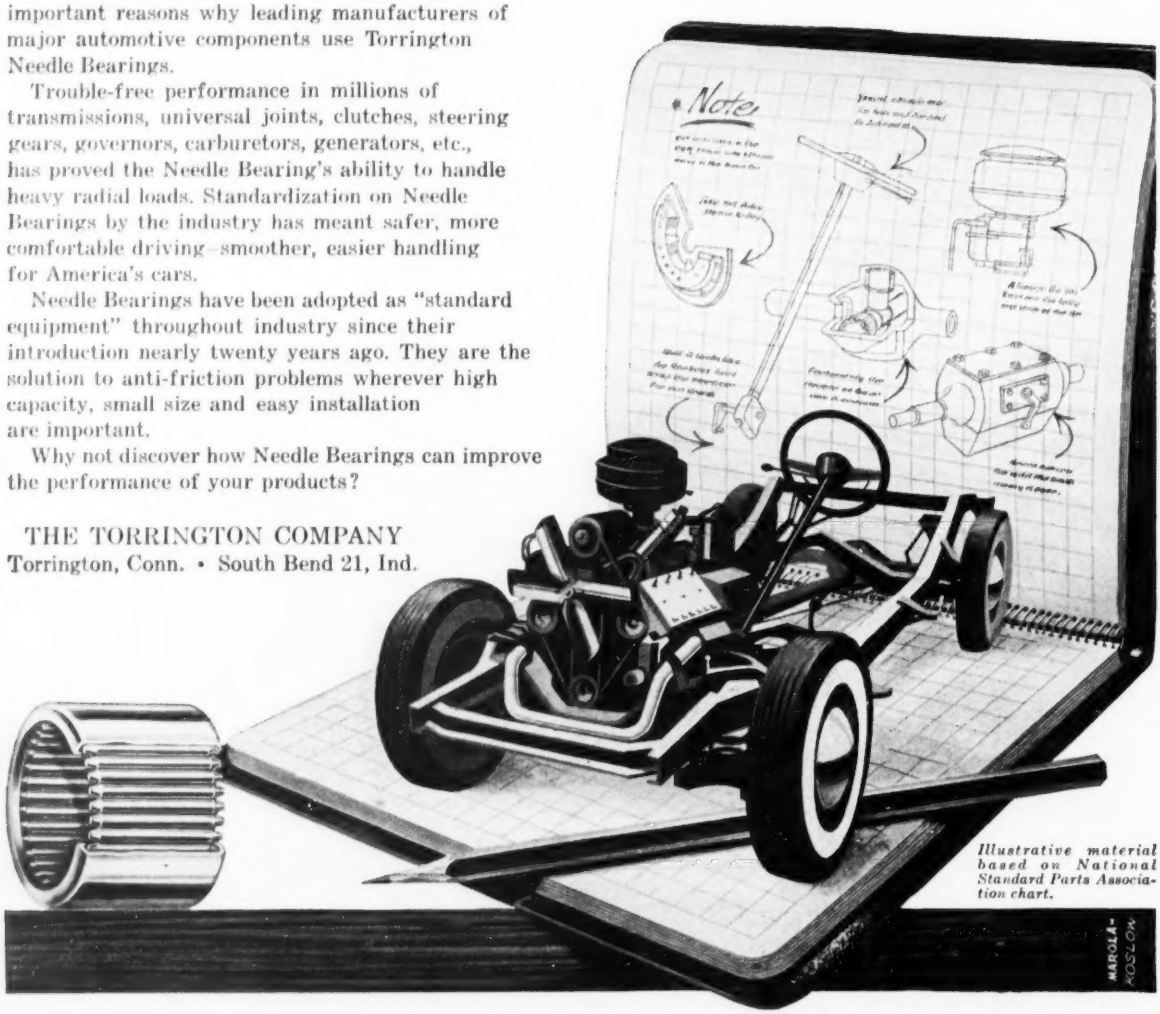
Low initial cost and ease of installation are two important reasons why leading manufacturers of major automotive components use Torrington Needle Bearings.

Trouble-free performance in millions of transmissions, universal joints, clutches, steering gears, governors, carburetors, generators, etc., has proved the Needle Bearing's ability to handle heavy radial loads. Standardization on Needle Bearings by the industry has meant safer, more comfortable driving—smoother, easier handling for America's cars.

Needle Bearings have been adopted as "standard equipment" throughout industry since their introduction nearly twenty years ago. They are the solution to anti-friction problems wherever high capacity, small size and easy installation are important.

Why not discover how Needle Bearings can improve the performance of your products?

THE TORRINGTON COMPANY
Torrington, Conn. • South Bend 21, Ind.



Illustrative material based on National Standard Parts Association chart.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Cylindrical Roller • Tapered Roller • Ball • Needle Rollers

Trade marks of some of the leading automotive component manufacturers whose products enjoy the benefits of Needle Bearings.

DETROIT UNIVERSAL JOINTS · Spicer · STEWART-WARNER · HOPPMAN · UNITIZED ELECTRIC ACTUATING DEVICES AUTOMOTIVE WINDOWS TOPS SEATS · DETROIT GEARS · ROCKFORD · GEMMER MANUFACTURING COMPANY · CLEVELAND UNIVERSAL JOINTS · WARNER GEAR CO. · KS · Accepted D A Standard

For more information on products advertised, use Inquiry Card, page 247



THE PRESS THAT WORKED ITSELF *INTO* A JOB!

This KRW 150-ton motor-driven Hydraulic Press works all day—every day—testing dies made by Phinney Tool & Die Co., Medina, N.Y. Some of these dies are small enough to fit in the palm of your hand; others weigh up to thousands of pounds.

Phinney had one interesting experience that demonstrates the amazing versatility of this Press. They received an order for a series of 4 progressive dies from a maker of tank parts. Phinney made the dies, tested them, and shipped them. A short time later the dies came back. They were excellent, but the customer didn't have a press large enough to run them. Would Phinney put the dies in production on the same Press that made the sample parts? Phinney accepted. And this same KRW Hydraulic Press has since turned out thousands of tank parts in addition to its regular work of testing dies.

You'll find the versatility and rugged construction of KRW Hydraulic Presses can save you time and money on many operations in your shop. 25-150 ton capacities; one, two or three cylinders; hand, air or motor driven. Write us for complete specifications and prices. Dep't. 15.

Maximum size Bed and Platen on 100 and 125 ton models—40"x60", on 150 ton models—36"x64". For facts, prices and delivery dates see your Machinery dealer or write, wire or phone Dep't. 15.

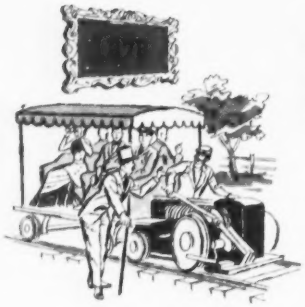
K·R·WILSON

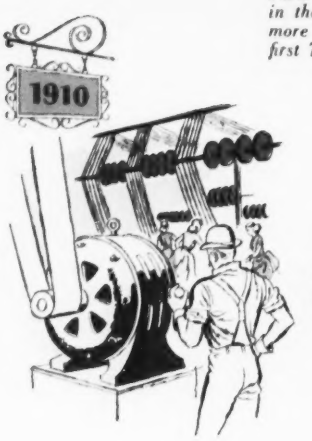
215 MAIN ST., BUFFALO 3, N. Y.

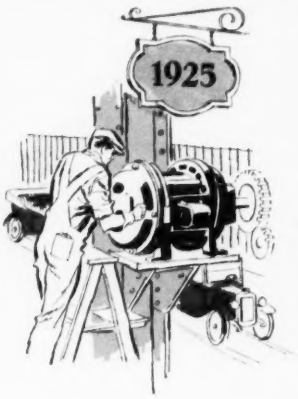


Designers and Builders of the Right Hydraulic Press to Solve Your Metal-working Problems!

1878: *Thomas Edison builds an electric motor for his Menlo Park "Express."* ... **1910:** *G.E. establishes motor leadership in the infant electric industry.* ... **1925:** *G.E. adds 4 times more power per pound as it develops newer models.* ... **1939:** *first Tri-Clad motor sets 14-year standard.*









General Electric Announces...

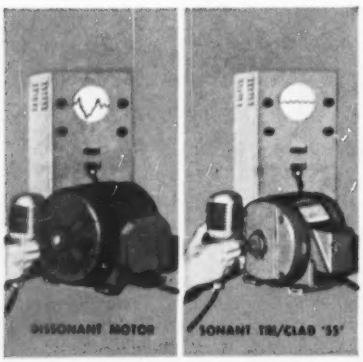
A NEW MILESTONE IN MOTOR HISTORY

New TRI 55 CLAD motor climaxes 75 years of engineering leadership

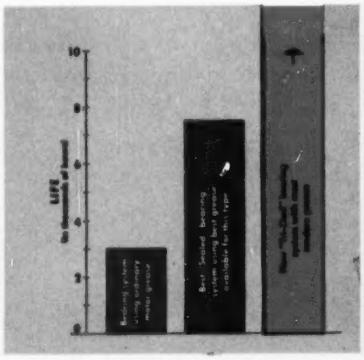
The General Electric Tri/Clad '55' is an important milestone in motor history. For this is a *completely new motor.* Born out of thousands of engineering man-hours, the Tri/Clad '55' incorporates design improvements that go far beyond mere modifications. Many years of pure research, the discovery of new, better materials, the knowledge of how to make better use of present materials, and improved manufacturing processes all make the Tri/Clad '55' motor the new leader in the motor field.

You as a motor user should take the opportunity to see and test this motor for yourself. Contact your nearest G.E. Apparatus Sales Office or G.E. Motor Agent and tell him you want to see the new G-E Tri/Clad '55'. General Electric Company, Schenectady 5, N. Y.

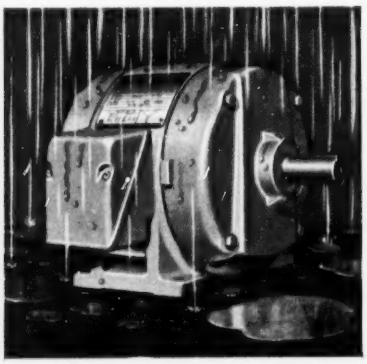
648-4



DESIGNED FOR BETTER PERFORMANCE: Tri/Clad '55' has a low noise level . . . runs cool . . . gives up to 53% increase in shaft output per pound...has higher full-load speeds.



ENGINEERED FOR LESS MAINTENANCE: 10%-life tests (such as the one shown) prove the Tri/Clad '55' bearings last longer without regreasing than any other bearing system.



BUILT TO LAST LONGER: cast-iron strength . . . more fully enclosed dripproof construction . . . water-shedding stator windings . . . polyester film insulation 8 times stronger.


GENERAL ELECTRIC
TRI 55 CLAD INDUCTION MOTOR
MODEL
HP
FL RPM
VOLTS
PHASE
CYCLES
FL AMP
TYPE
FRAME
TIME RATING
E RISE
TRI 55 CLAD
THE LEADER IN MODERN MOTOR DESIGN
Progress is our most important product
GENERAL ELECTRIC

FOR HIGHER PRODUCTION

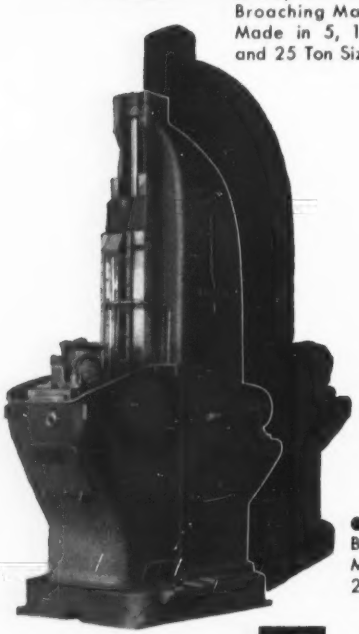
investigate...
surface broaching
for difficult
machine work



● Duplex Surface Broaching Machine. Made in 5, 10, 15, and 25 Ton Sizes.

● Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. We will be glad to work with you on the application of surface broaching.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio
Detroit Office: General Motors Building



● Single Slide Surface Broaching Machine. Made in 5, 10, 15, and 25 Ton Sizes.



● Continuous Type Broaching Machine. Made in 4 Sizes.

FOOTBURT

SURFACE BROACHING

For more information on products advertised, use Inquiry Card, page 247



Building KK, the Diesel Engine Factory, a portion of Caterpillar's Peoria, Illinois, plant.



"Caterpillar Tractor Co. has always followed a practice of evaluation and replacement of machine tools and other manufacturing facilities to keep pace with advances in technology and the normal loss of efficiency due to wear and tear. Improvements in the methods employed in this program are constantly sought.

"Recently, a special group of men from the manufacturing, engineering and accounting departments were assigned to undertake a critical review of the company's machinery replacement practices. Special requirements of the company together with the wealth of excellent literature on the subject were studied and discussed. Cost history affecting replacement decisions was carefully examined.

"The result was the adoption of a new replacement evaluation program designed to give improved appraisals of the merits of replacement proposals. The procedure is basically a modification of the MAPI formula.

"Detailed studies are now prepared, showing comparisons of annual cost of operating present and proposed equipment, including allowances for capital recovery, tooling, maintenance, repairs, labor, spoilage, etc.

"Annual savings possible through replacement are related to net additional investment to obtain the return on that investment. The adequacy of the percentage of return on individual proposals is weighed in the light of current business conditions. Consistency in preparing proposals permits a ranking in order of percentage of return as well as in dollar amount of required investment thus spotlighting those replacement proposals which yield the greatest relative advantage.

"A fundamental part of the program is a retrospective review of replacements to compare actual gain with that anticipated and for the purpose of improving accuracy in forcasting.

"This program has provided Caterpillar management with an excellent tool for more systematic determination of the comparative advantage and timing of replacements."

H. S. EBERHARD
Executive Vice President
CATERPILLAR TRACTOR CO.

ROCKFORD

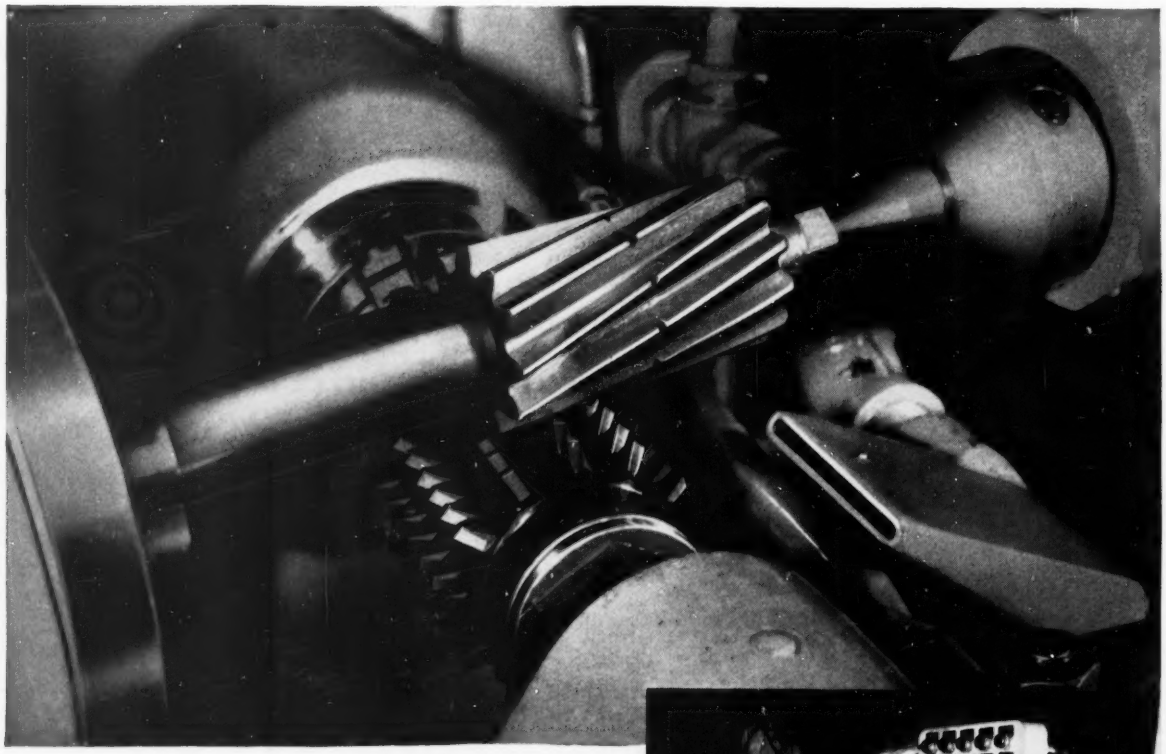
INSERT

GROUP

Keep Gathering Metal-Working Production Ideas...Be Well Informed When The Time For Replacement Arrives . . . . . .

December, 1953

AUTOMATIC HOB SHIFTING





International Harvester Farmall Works were re-sharpening hobs on this pinion job after every 103 pieces. Hob shifts were made manually in 3 or 4 predetermined settings. Unavoidable minor variations in the amount and number of pieces per shift frequently produced some hob teeth which were worn more than others. A compensating amount of stock consequently was removed with each sharpening, reducing the potential number of sharpenings.

New Barber-Colman No. 16-16 Hobbing Machines, equipped with Automatic Hob Shifters, were installed. Now, after each cut, the hob is automatically shifted .0085" to a new cutting position. Production has jumped to 233 pinions per hob sharpening. All hob teeth show a uniform amount of wear, requiring only .010" stock removal per sharpening. Time required on sharpening machines has been reduced accordingly. Tool costs have been cut to one-third.

BUILDERS OF PRECISION GEAR

MADE IN
ROCKFORD... TESTED ENGINEERING AND CRAFTSMANSHIP
ILLINOIS, U.S.A.



Machinery, December, 1953

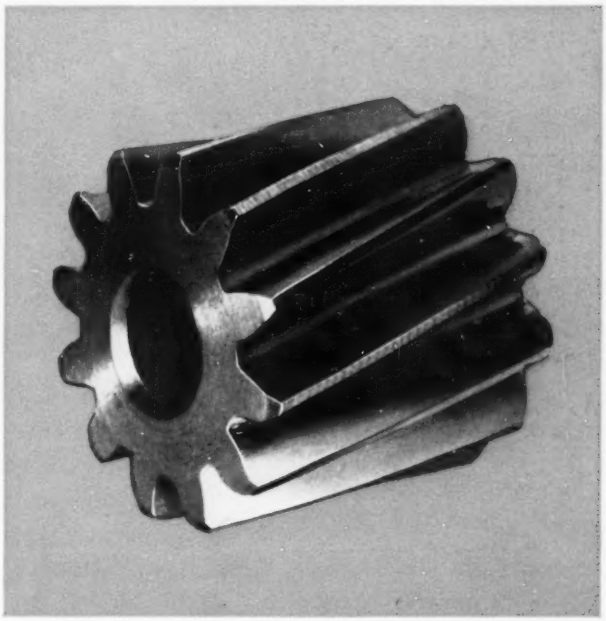
INCREASES HOB LIFE

INTERNATIONAL HARVESTER GAINS 130 MORE GEARS PER SHARPENING

Based on the number of hob sharpenings and the amount of stock removed per sharpening, these results indicate an increase in tool life of from 103 to 233 pieces per sharpening.

When you control uniformity and frequency of hob shifting, costs go down — tool life and production go up. The Barber-Colman Automatic Hob Shifter is equipped with change gears so that the hob can be shifted a pre-determined amount after each work load has been cut. Thus, the amount of shift can be selected so that the maximum number of pieces per hob will be produced. Safety interlocks prevent the shifter from operating during the cutting cycle, and torsion bar springs clamp the hob slide rigidly under maximum load.

See your Barber-Colman representative today, and ask him about Automatic Hob Shifting for your gear production. Write us for a copy of the new No. 16-16 Hobbing Machine Bulletin.



HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN®

Barber-Colman Company

GENERAL OFFICES AND PLANT, 6212 ROCK STREET, ROCKFORD, ILLINOIS

HOBS AND MACHINES SINCE 1911

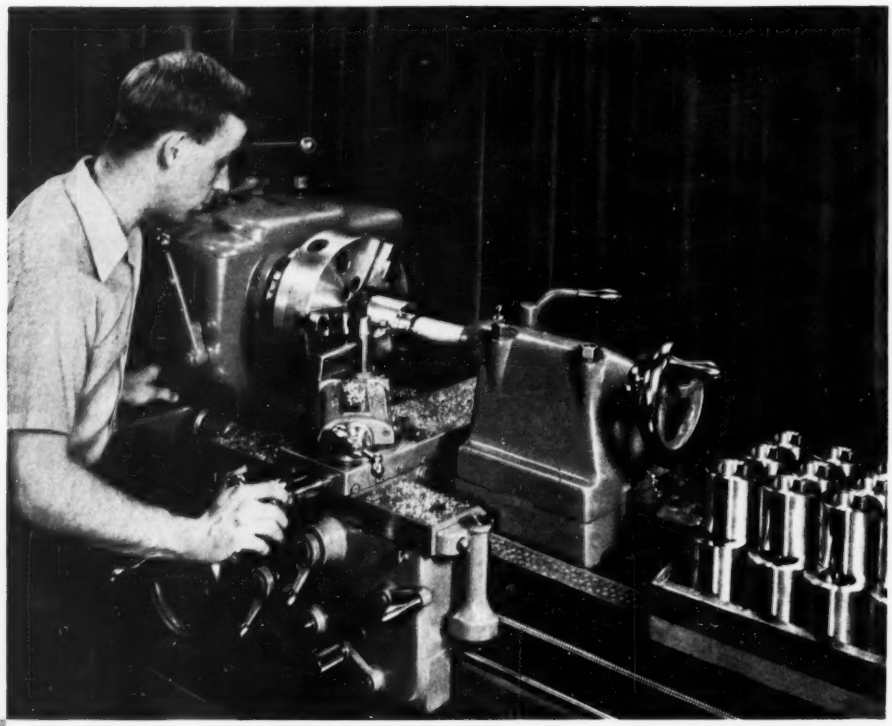


MADE IN
FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD
ILLINOIS, U.S.A.

Machinery, December, 1953

PRECISION PRODUCTION

with ROCKFORD ECONOMY LATHES



MEDIUM-SIZED

ECONOMY-PRICED

Big Accurate Lead Screw

Independent Feed Shaft

Precision Timken Bearing Spindle

Heavy Tail Stock, Anti-Friction Thrust Bearings

Hobbed and Shaved Headstock Gears

Tool Room Accuracy, Zero Precision Bearings

All-Geared Head, Quad-V-Belt Drive

Heavy Cuts, 16" or 18" Swing, 30" Center Distance

6' Bed, Double Wall Apron, 3100 lbs. Total Weight

With these features Rockford Lathes offer you either Tool Room or High Production operation, with modern design, ample dimensions and high quality materials.

Ask a Rockford Machine Tool Representative to give you full details on the practical production advantages of these heavy service, medium sized, economy priced machines.

ROCKFORD ECONOMY LATHES—16" and 18"

ROCKFORD MACHINE TOOL CO.

2500 KISHWAUKEE STREET • ROCKFORD, ILLINOIS

MADE IN

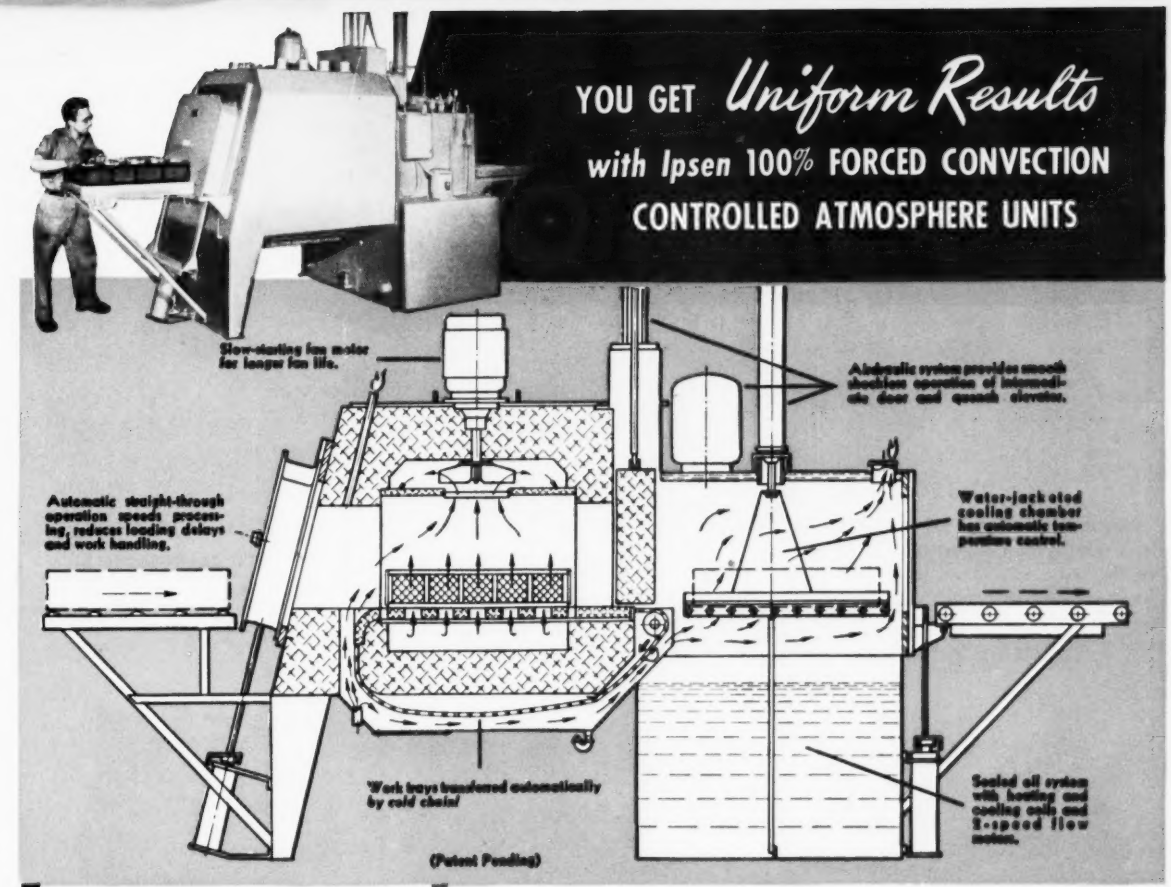
ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL

ILLINOIS, U.S.A.



Machinery, December, 1953

YOU GET *Uniform Results* with Ipsen 100% FORCED CONVECTION CONTROLLED ATMOSPHERE UNITS





SIMPLE CHANGE-OVERS

Change-over from one process to another is simple, quick, and easy. Settings for heat, atmospheres, quench and oil flow is all that is required. Cycle is then controlled automatically.

★Above is a cross-section view of the Ipsen 400 Lb./Hr. Furnace showing the advanced design features which have made Ipsen the largest manufacturer of carbonitriding and batch-type heat treating units. With these new units, you get the advantages of 100% forced convection heating and controlled atmosphere processing, *plus* the full benefits of automatic straight-through operation. Thus, you eliminate loading delays and guess-work. You control distortion and get uniform results from batch to batch . . . today, tomorrow, or next year. You eliminate blasting and pickling operations and you can often use lower grade, less costly steels.

A SINGLE UNIT HANDLES ALL OF THESE OPERATIONS

Unusually versatile, the Ipsen is built for temperatures up to 1850° F., and a single unit is equipped to handle all of the following processes:

ATMOSPHERE COOLING	OIL QUENCHING
Normalizing	General Hardening
Stress Relieving	Carburizing and Hardening
Carburizing	Carbonitriding
Carbonitriding	Martempering

Send **Samples for Free Estimate** — find out how the new Ipsen Units can be applied to your job. Samples of your work will be run, procedures established in our new, modern lab, and cost estimates given without obligation.

Write **for New Literature** — illustrates new design features, gives complete specifications of various units.



AUTOMATIC **Ipsen** HEAT TREATING UNITS

IPSEN INDUSTRIES, INC. 717 South Main Street; Rockford, Illinois

Universal Units to CARBONITRIDE • CARBURIZE • HARDEN • BRAZE • MARTEMPER • WASH • TEMPER



MADE IN

YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...**ROCKFORD**

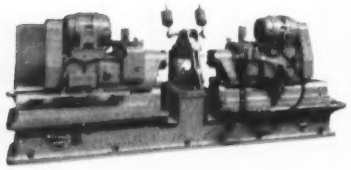
ILLINOIS, U.S.A.

10 solutions

TO DIVERSE PRODUCTION PROBLEMS WITH

W. F. & JOHN BARNES SPECIAL MACHINES AND EQUIPMENT

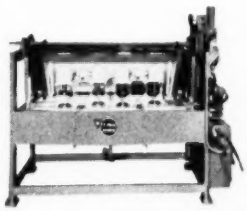
The 10 examples shown here are typical of the broad range of special machinery and allied equipment that are today designed and built at W. F. & John Barnes. All have been especially engineered to meet a specific production problem. Each represents a profitable solution to the problem of saving time and cutting costs. Collectively, these machines present tangible evidence of the coordinated skills and versatility of machine building experience available to you at Barnes.



1 TWO-WAY HORIZONTAL BORING MACHINE — rough bores and chamfers automobile transmission cases at 82.5 pieces per hour (80%). This unit completes 18 operations.



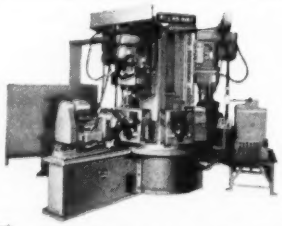
2 BARNES SPECIAL MACHINE — drills and counter-sinks Tractor Spindle Extensions. Performs ten operations with pieces completed at the rate of 19.5 per hour (80%). Center head has 4-spindle cluster arranged for pivoting to provide adjustable spindle pattern.



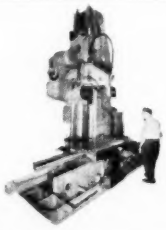
3 SPECIAL SEMI-AUTOMATIC TESTING MACHINE — developed to test for leaks in automotive power steering castings. Four castings are inspected with each machine cycle. Workpieces are loaded and unloaded manually . . . all other operations are performed automatically.

4 AUTOMATIC RETORT LOADING MACHINE — one of a variety of special equipment, such as glass handling machines, can unloaders, carton uncasers, and special conveyors, designed and built by Barnes for the food, chemical, and beverage industries.





5 BARNES 6-STATION CENTER COLUMN MACHINE — with 72" diameter indexing table, completes 18 operations per piece, 118 pieces per hour, on Cast Aluminum Transmission Extension Housings in a large automotive plant.



6 SPECIAL VERTICAL SINGLE-SPINDLE MILLING MACHINE — with 72" saddle, slab and face mills mounting pads on a variety of motor frames. Quick setup features enable 6½ pieces to be completed per hour.

W. F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1879

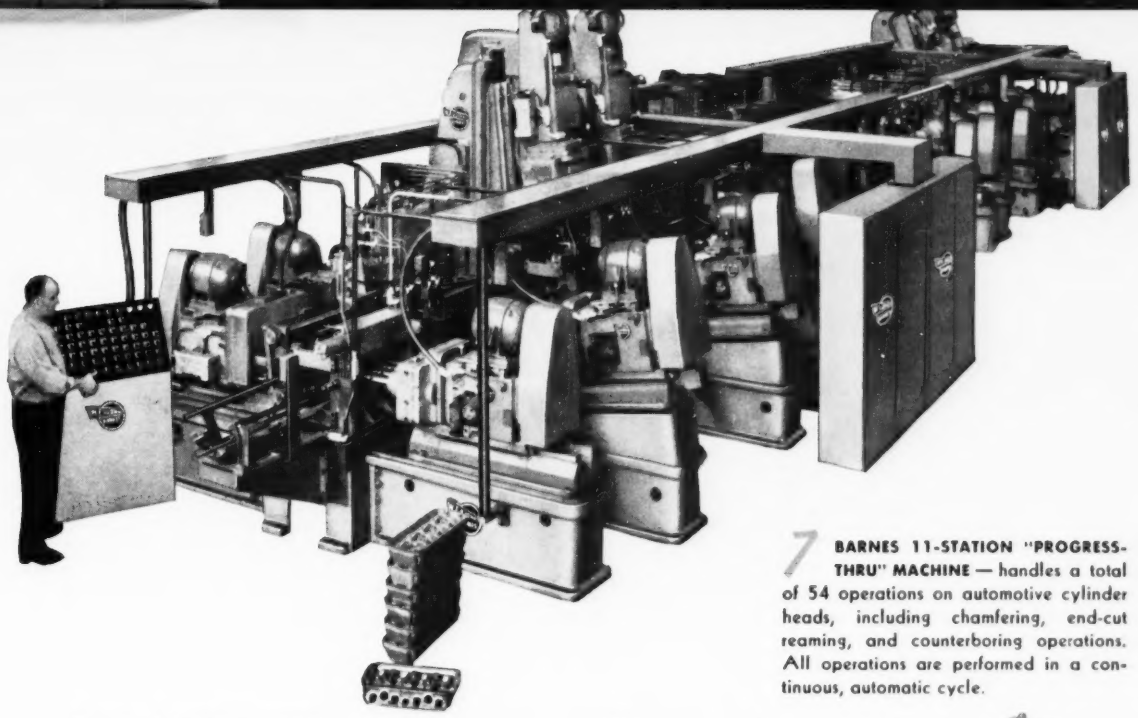
MULTIPLE SPINDLE DRILLING • BORING • TAPPING

MADE IN

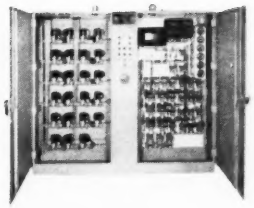
ROCKFORD...MACHINE TOOL SHOPPING CENTER

ILLINOIS, U.S.A.

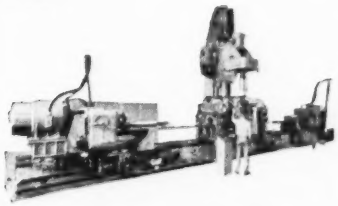




7 **BARNES 11-STATION "PROGRESS-THRU" MACHINE** — handles a total of 54 operations on automotive cylinder heads, including chamfering, end-cut reaming, and counterboring operations. All operations are performed in a continuous, automatic cycle.



8 **ELECTRICAL CONTROL PANEL** — automatically controls regeneration and service operations on two sets of deionizing tanks, alternating units for a constant supply of treated water . . . one of countless applications where Barnes Electrical Controls add efficiency and economy to everyday industrial operations.



9 **SPECIAL TWO-WAY VERTICAL AND HORIZONTAL BORING MACHINE** — rough, semi-finish, and finish-bores, chamfers, and faces Final Drive Housings. Spindles automatically change speeds and feeds to meet boring and facing requirements.



10 **APRON-TYPE CONVEYOR** — especially designed for efficient removal of chips from machines used in a large automotive plant. Barnes Conveyors have been designed and built for a wide variety of applications.

BARNES SPECIAL MACHINE TOOL BUILDING SERVICE INCLUDES...

SPECIALIZED MANUFACTURING FACILITIES — 75-year background, large well equipped plant efficiently tooled to produce high production machines.

SPECIAL HYDRAULIC EQUIPMENT — designed and built to meet JIC standards. Individually engineered units assure smooth, dependable actuation for every requirement.

SPECIAL ELECTRICAL EQUIPMENT and CONTROLS — individually designed and built for maximum safety and ease of control with circuits that assure the most dependable coordination of all machine functions.

SPECIAL GAUGES, FIXTURES, TOOLS — designed for each individual machining problem, assure accuracy of operations at high production speeds.

SPECIAL HANDLING AND CONVEYOR EQUIPMENT — designed and built to reduce work handling, effect maximum safety and efficiency.

COORDINATED DESIGN AND ENGINEERING — Mechanical, Hydraulic, Electrical, Process, Tool, and Fixture Engineers work together at Barnes. Teamwork solves complex problems quickly.



Write **FOR FREE DATA**

"Coordinated Machine Engineering" — a free booklet describing modern machines and mass production technique. Write for your free copy today.

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MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES



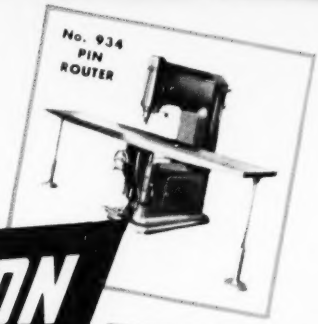
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ROCKFORD MADE MEANS PRECISION MADE...ROCKFORD

ILLINOIS, U.S.A.







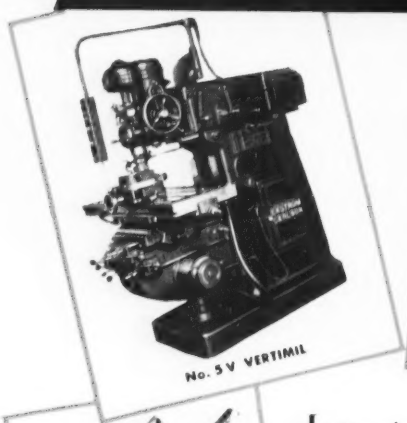
EKSTROM, CARLSON







HIGH-PRODUCTION MACHINE TOOLS

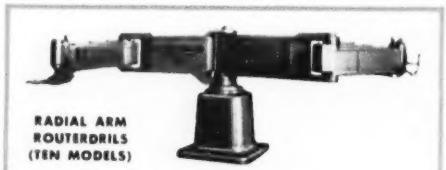


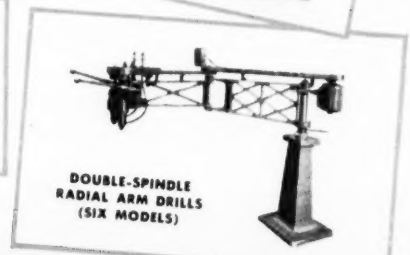






In practically every metal-working shop there is a place for one or more of these machines and tools. Keep a sharp eye on EKSTROM, CARLSON . . . for *brand new* and startling ideas in machine tools and high-production equipment.





Write for Literature:
Ask for our latest Bulletins on any of these products that interest you, and watch for announcements of new developments.

ECCO

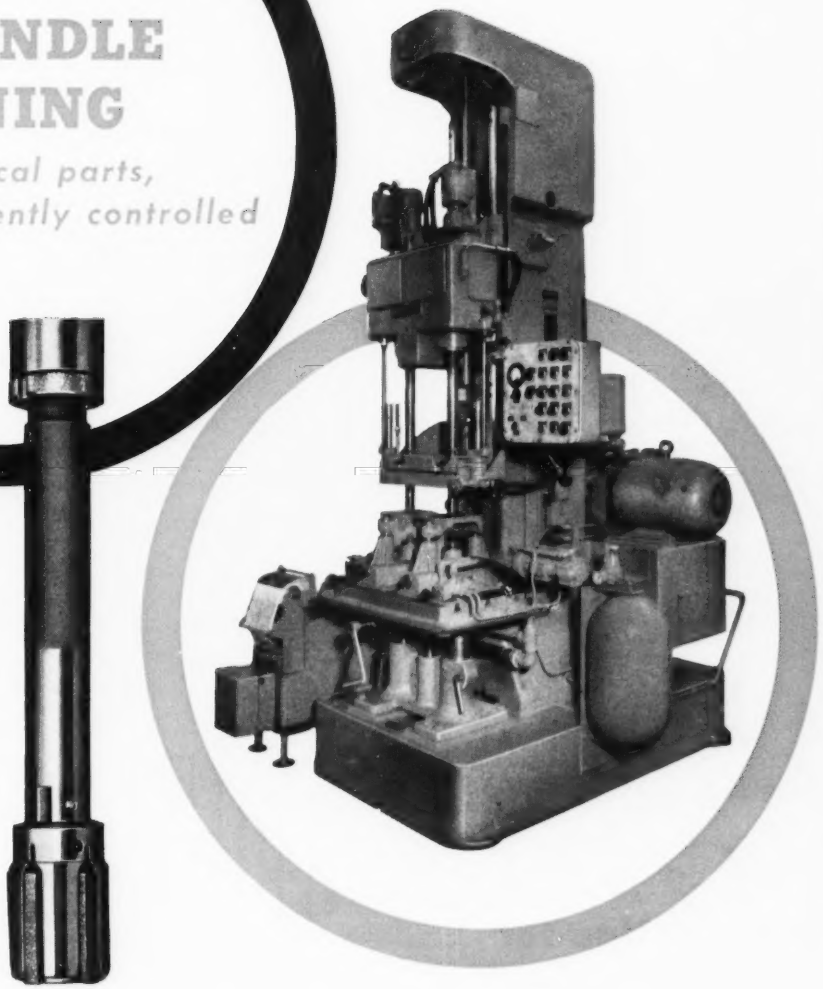
EKSTROM, CARLSON & CO. 1400 RAILROAD AVE., DEPT. M-4, ROCKFORD, ILL.

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ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
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2-SPINDLE HONING

on identical parts, each independently controlled



SIZE
FINISH
STRAIGHTNESS
AND
ROUNDNESS

Automatically Controlled Through

BARNESDRIL
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Get a Copy of this New Complete Honing Service Bulletin. Write for Bulletin B5005.

Precision honing on a high production basis is automatically controlled for size, straightness and roundness, with **BARNESDRIL** Plugmatic Sizing. 2-Spindle operation, each spindle independently controlled, affords a high rate of output with identical bore-to-bore sizing and finish. **BARNESDRIL** Honing Tools and Abrasives are engineered and adapted to suit the special job conditions. Results are stepped-up output of high quality pieces, at a new low cost per piece.

Consult a **BARNESDRIL** engineer on your bore finishing problems. With background ranging from development of the first production Honing Machine to automatic size control, they can assist you with design engineering, machines, tools and abrasive stones.

HOLE **BARNESDRIL** FINISHING

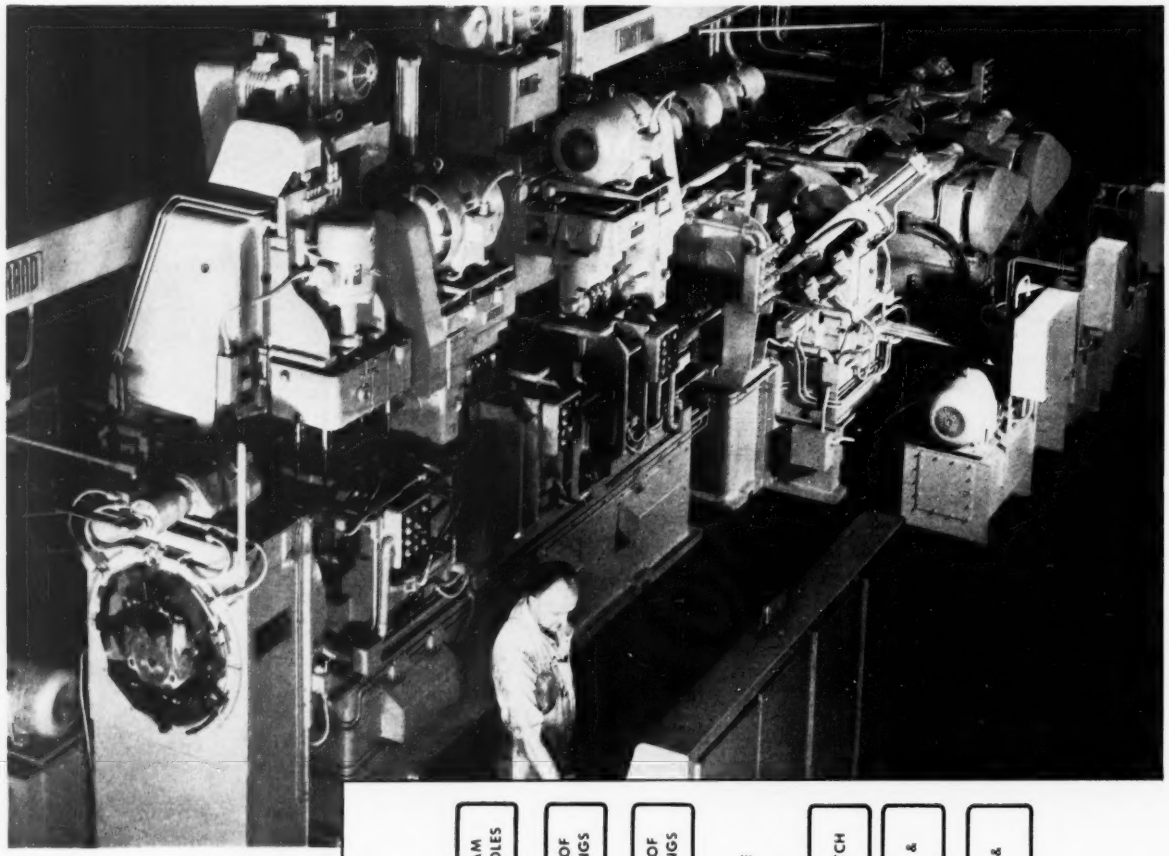
BARNES DRILL CO.

820 CHESTNUT STREET • ROCKFORD, ILLINOIS

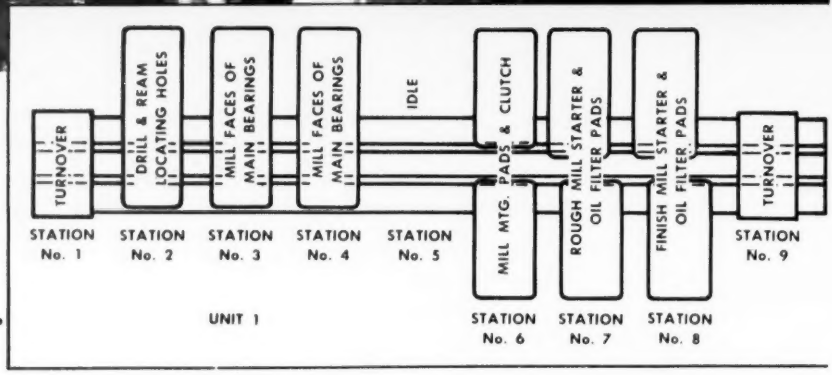


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CENTER OF MACHINE TOOL EXCELLENCE... **ROCKFORD**
ILLINOIS, U.S.A.

Another Example of SUNDSTRAND



12 Station Process Line for Cylinder Blocks



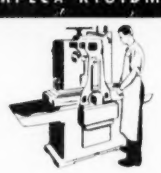
Whether processing several parts over one machine or one part through several machine elements, as shown above, Sundstrand "Engineered Production" results in the most economical method of machining to meet the job at hand. It consists of determining the most profitable and productive processing method first, then, providing the machines to suit this method — standard or semi-standard

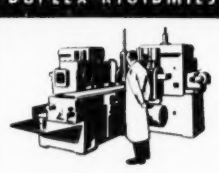
AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

SUNDSTRAND "Engineered Production" Service*

*REG. U.S. PAT. OFF.







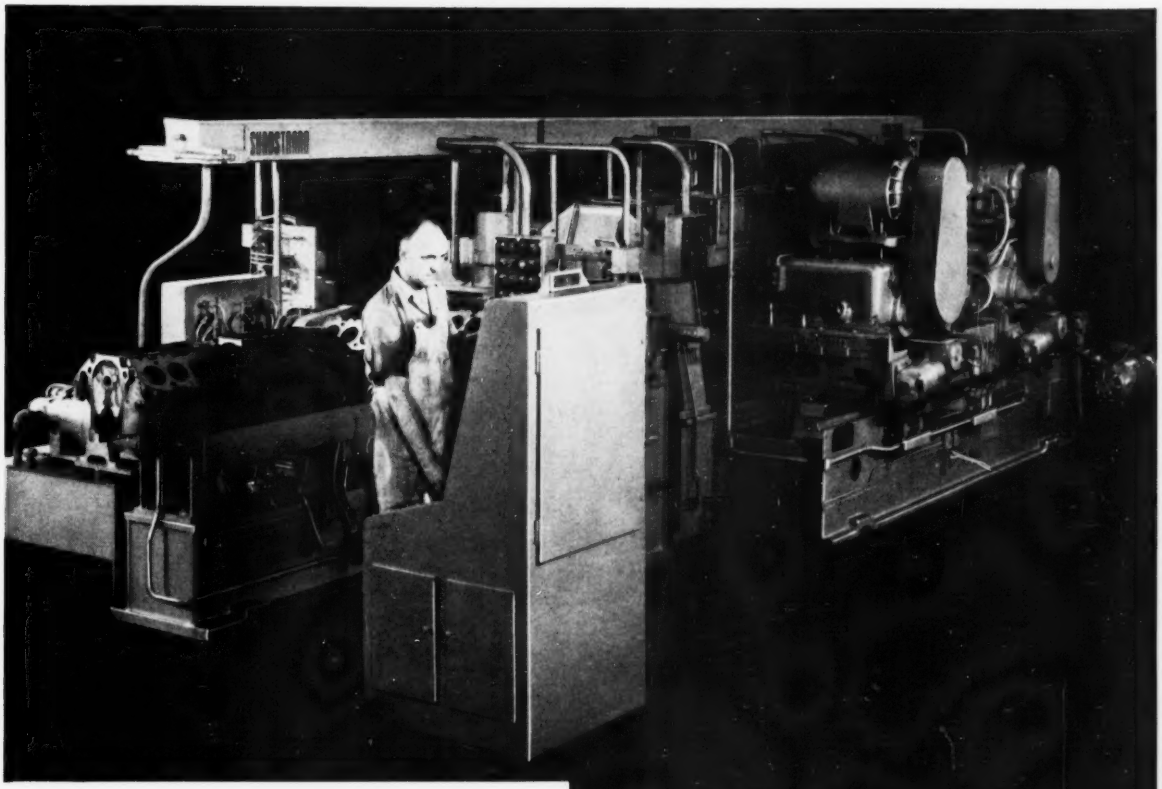
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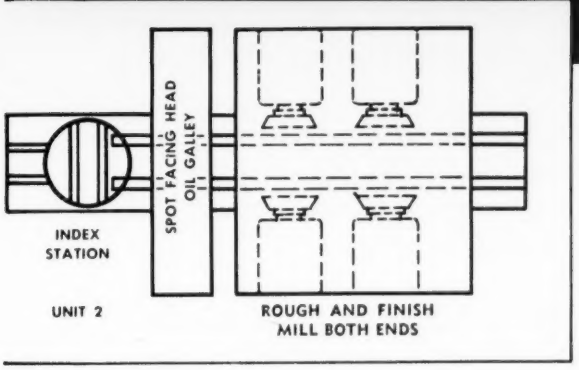
ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS

ILLINOIS, U.S.A.



"ENGINEERED PRODUCTION"

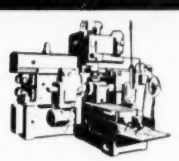


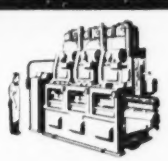


machines, if possible, or entirely special machines, if necessary. This special Sundstrand 12 station transfer type machine is a good example of the results of Sundstrand "Engineered Production" Service. The drawings and photos show the two units which are joined together in the production line. Cylinder blocks are automatically handled from incoming to outgoing end of machine for operations as indicated on drawing. Production rate is approximately 80 pieces per hour. If you have metal working operations in your plant, call in a Sundstrand Process Engineer. There is no obligation for this service.

SUNDSTRAND
Machine Tool Co.
2530 Eleventh St. • Rockford, Ill., U.S.A.

TRIPLEX RIGIDMILS | SPECIAL MACHINES







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YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN... **ROCKFORD**
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GREENLEE *Automatics*



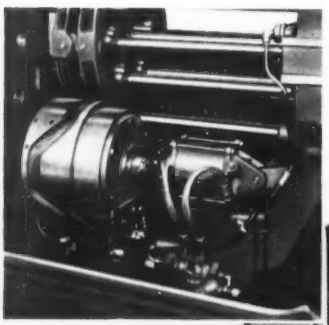
Close-up of the rear stock reel support, showing a piston (which follows and pushes the stock) being inserted in a stock tube. The air hoses are equipped with speed couplers.

AIR-FEED

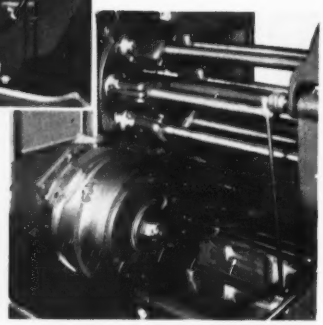
(PNEUMATIC STOCK FEED)

This method of feeding out stock was developed primarily for the many screw machine jobs that require either multiple feed-out arrangements, greater feed-out length than the conventional mechanical arrangement will permit, or for machining parts made from ground stock where pusher marks would be objectionable. It can be adapted to all 1" and 1⅝" GREENLEE Automatics.

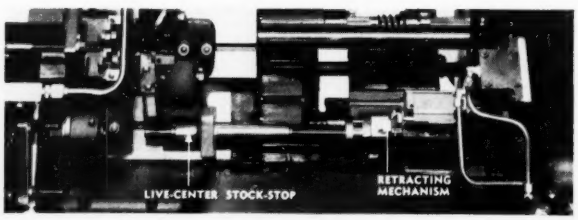
- FEEDS OUT STOCK TO 16½"
- PROVIDES MULTIPLE FEED-OUT
- ELIMINATES STOCK SCORING
- REDUCES STOCK REEL NOISE
- ELIMINATES STOCK PUSHERS
- ELIMINATES FEED-OUT CAMS



Left: One method of opening and closing the collets for multiple feed-out. The air cylinder, controlled by a plate cam on the cam drum, actuates the collet-operating rings. Various arrangements can be made, depending on the requirements of the particular job being set up.



Right: Simplification of the feed cam drum possible with air feed, where the collets are to be opened by the conventional mechanical arrangement between the 6th and 1st positions. Feed-out is usually against a standard fixed stop stock in such cases.



Above: A method used for feeding out stock during the machining cycle. The stock is fed out against an adjustable live-center stock-stop arrangement. When the collet jaws are closed, the live-center retracts and permits the stock to rotate freely and index to the next position.

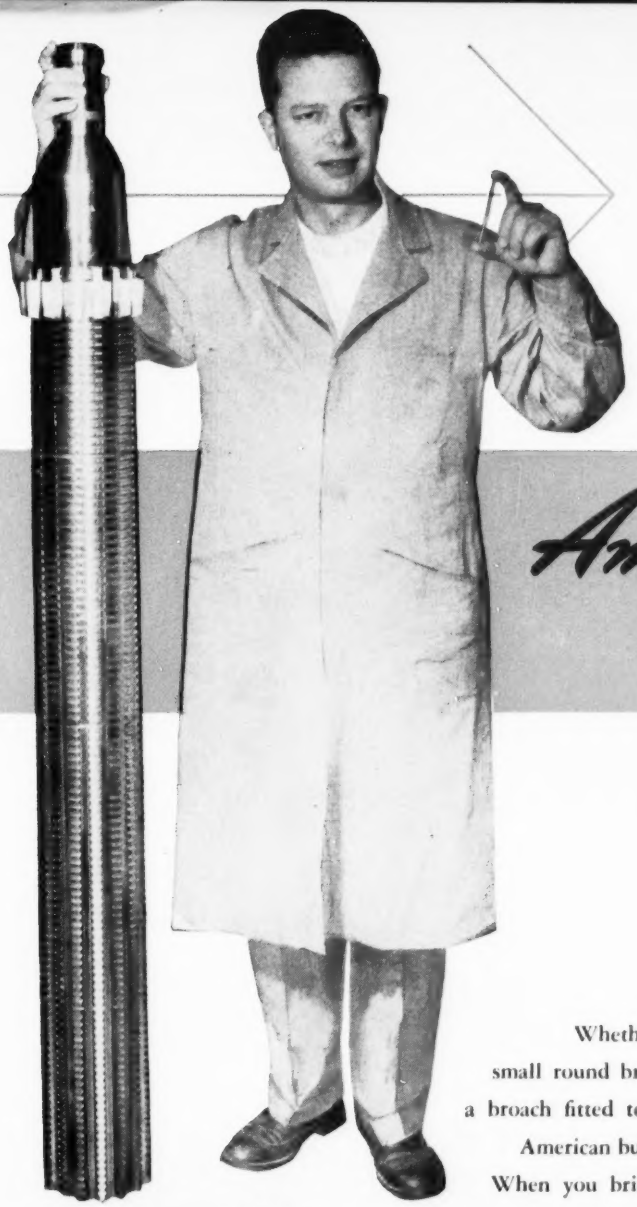
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GREENLEE BROS. & CO., 1872 MASON AVE., ROCKFORD, ILL.

MADE IN ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION

ILLINOIS, U.S.A.





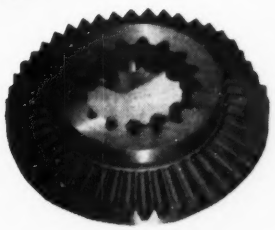
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FOR PRODUCTION MACHINE TOOLS IT'S...ROCKFORD

ILLINOIS, U.S.A.



Mattison Grinder beats old time (15 hours) by 12 hours

The picture above shows a punch and die grinding operation on a Mattison High-Powered Precision Surface Grinder at Lyon Metal Products, Incorporated. Previous time on a converted planer-grinder was 15 hours — now with a Mattison Grinder equipped with special fixture, grinding time has been reduced to 3 hours.

Mattison Grinders are proving profitable investments in plants where "time out" for reconditioning is a vital factor in meeting production schedules. Surfaces are reconditioned and edges sharpened in a minimum of time, eliminating costly delays and holdup of production. Many manufacturers installing the Mattison Grinder for reconditioning dies find many other uses for it in grinding flat surfaces where accuracy and fine finish are required. For complete information on the Mattison High-Powered Precision Surface Grinder, send for free copy of our latest circular.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

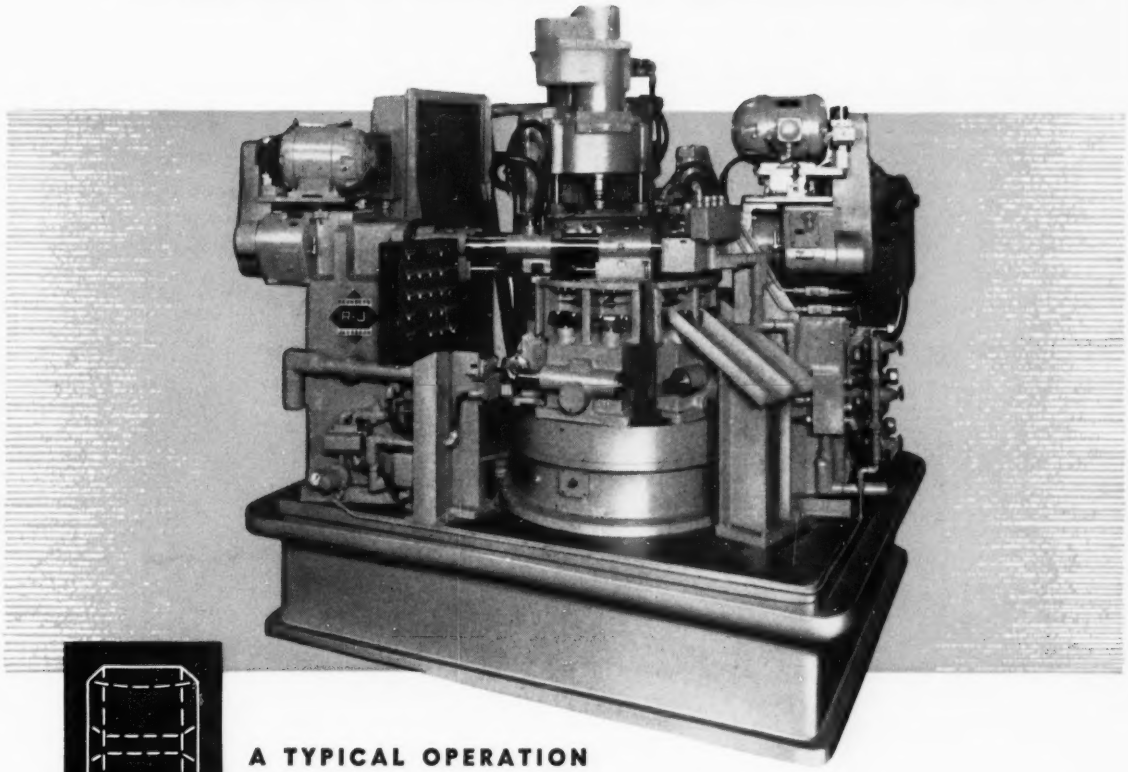
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ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT
ILLINOIS, U.S.A.



Rehnberg-Jacobson

DRILLING AND SLOTTING MACHINE

4 OPERATIONS ON EACH OF 4 PIECES EVERY 12 SECONDS



A TYPICAL OPERATION FREQUENTLY REQUIRED

The particular piece for which this machine was designed is a Front Suspension Ball Joint Stud for a new model automobile. However, the same problem — that of drilling and countersinking a cotter-pin hole and slotting the end of the piece — occurs with many threaded shafts, studs, and similar parts. This five-station machine handles the job neatly by first spot drilling both sides (using a reachover unit for the back side) to effect the countersinks, then sawing the slot, and finally drilling the hole. Fixtures hold four pieces each and are quickly interchangeable for two sizes of studs with some mixing permitted. Automatic unclamping and ejection is provided. Rating of the machine is approximately 1100 pieces per hour. Do *you* have any studs or shafts you want drilled and slotted on a production basis?

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF SPECIAL MACHINERY

2135 KISHWAUKEE ST. ROCKFORD, ILLINOIS



FOR METAL REMOVAL WITH ACCURACY AND SPEED...ROCKFORD

MADE IN ILLINOIS, U.S.A.

THE INGERSOLL CUTTER GRINDER

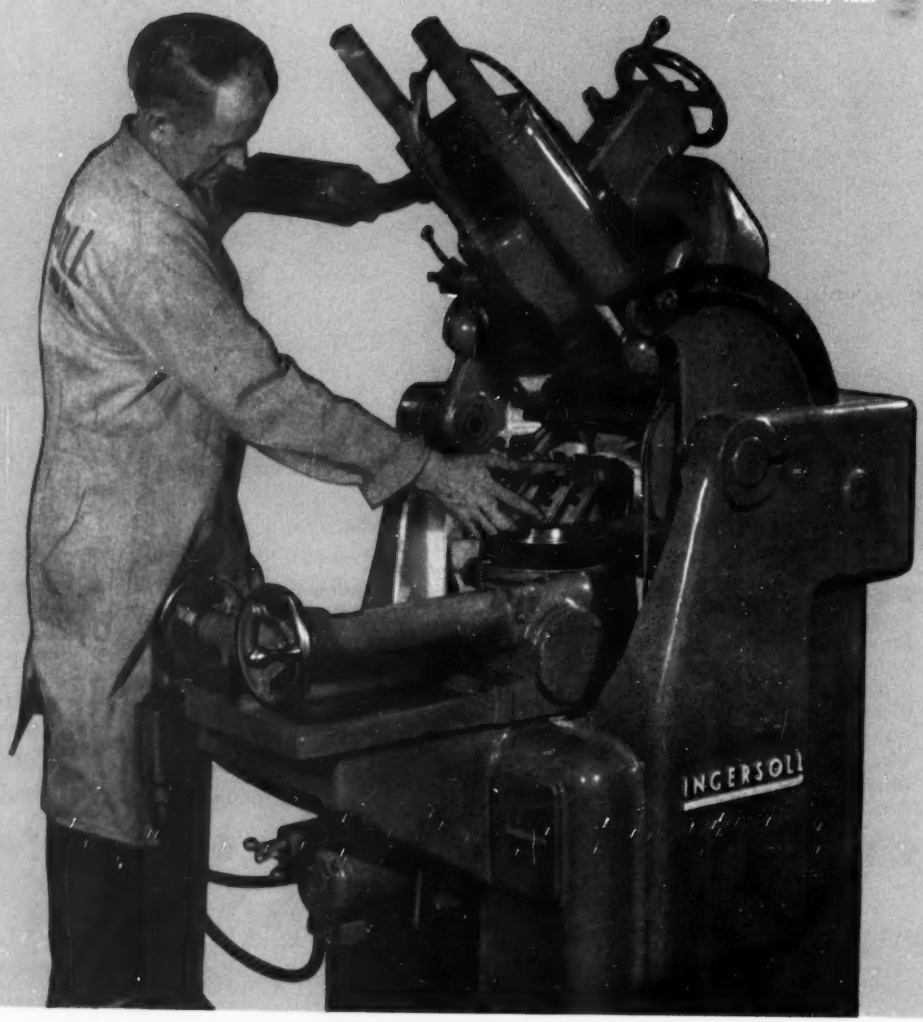
Improved

. . . MORE POWER FOR FASTER ROUGHING
. . . EASIER TO OPERATE
. . . LESS MAINTENANCE

It's a good time to check the condition of your present equipment for sharpening face mills and other inserted blade milling cutters.

WRITE FOR NEW CUTTER GRINDING MANUAL NO. 628

THE INGERSOLL MILLING MACHINE CO. • ROCKFORD, ILL.



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eliminate the guesswork in selecting tool steels

Thousands of metal working people are using the Crucible Tool Steel Selector to determine exactly which type of steel they need. This handy selector covers 22 tool steels which fit 98% of all tool steel applications.

The selector is unique because it starts with the ultimate use of the steel. It breaks down all tool steel applications into six major classifications, under which the different grades of steel available for certain specific requirements are indicated in legible cutouts. Heat treatment and machinability data are also included for each grade.

A flip of the dial will give you the answer, and almost just as quickly you can get the steel you select. For each type of steel shown on the selector is in stock in Crucible warehouses, conveniently located throughout the country.

To get your Selector merely fill in the coupon and mail. There is no obligation whatsoever.



⅓ actual size, Selector is in 3 colors

HERE'S AN EXAMPLE:

Application — Deep drawing die for steel

Major Class — Metal Forming — Cold

Sub-Group — Special Purpose

Tool Characteristics — Wear Resistance

Tool Steel — Airdi 150

A turn of the dial does it! And you're sure you're right

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Name_____

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CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking **TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

For more information on products advertised, use Inquiry Card, page 247



CHASE WIRE can help keep your production costs down

You cut down rejects when you use Chase Brass and Copper Alloy Wire.

Chase mills inspect every coil of wire produced. No scratches, no slivers, spills, or laps! Chase wire is of uniform temper and grain size, uniform in surface texture and color, accurate in gauge. It comes to you clean and bright.

Chase wire is available in a wide variety of alloys, shapes, sizes and tempers.



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Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



Bethlehem's large tool steel depot carries a complete range of sizes in 24 different grades of steel to facilitate rapid shipment to distributors.

Prompt Service?

See Your Tool Steel Distributor

Being Johnny on the spot is but one of many services performed by the tool steel distributor. He knows what's needed in your area, and to make sure your requirements are met promptly, he keeps large stocks of tool steel on hand. You'll find him always ready to lend you a helping hand, too, whether you require a simple operation like cutting bars, or something much more complex, such as determining the kind of heat treatment needed.

It's all to the good when you have a tool steel distributor near you, for then it's not necessary to carry large inventories. What's more, the distributor often has a supply of other steel specialties that you may need.

All distributors of Bethlehem Tool Steels are friendly, reputable firms, well known for their good service. They're good people for you to know. Our hat is off to them for a fine job — each and every one.



BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Use Fresh Water for Quenching Tools

It makes no difference what the source may be — fresh water is simply unsuitable for the quenching of tools. For all fresh water contains dissolved gases, which are released at the surface of the tool when it is quenched. The small gas pockets thus formed can prevent contact between the tool and water, and the resultant ineffective quench causes soft spots. These soft spots are likely points for cracks to occur in the tool.

A good way to avoid this trouble is to quench in water which has been boiled to remove the dissolved gases. Suppose the water cannot be boiled? Then expel the gases by quenching a large amount of hot "dummy" material. Even better would be a 10 pct brine solution, made up using degassed water.

New Booklet on Bearcat Tool Steel

We recently issued an attractive 2-color booklet on Bearcat Tool Steel — the versatile general purpose steel that is so well suited for applications involving high shock resistance. The 8-page illustrated booklet contains a wealth of information about Bearcat — goes into considerable detail about its hot work and easy machining properties.



Bearcat is a super-steel in every respect. It is air-hardening, thus minimizing quenching hazards, and it has good resistance to distortion during heat treatment.

OTHER ADVANTAGES OF BEARCAT

In addition to superior shock resistance, Bearcat has these other important advantages:

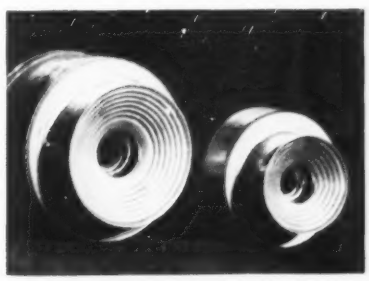
1. Deep hardening
2. Easy machining (Brinell 197 max)
3. Low distortion in heat treatment
4. Good hot work properties
5. Easily carburized for long wear

TYPICAL ANALYSIS

C	Mn	Si	Cr	Mo
.50	.70	.25	1.25	1.40

Bearcat is especially recommended for both hot- and cold-shock applications such as rivet sets, chisels, punches, hot headers, and gripper dies. It is also ideal for short-run dies used in cold forming, blanking, and bending, as well as for engraving dies, die-casting dies, and master hobs. It has many other uses, too.

It will be worth your while to look into Bearcat. Why not talk it over with your Bethlehem tool steel distributor? And of course you'll want to read the new booklet on Bearcat. Write to the Publications Dept., Bethlehem Steel Company, Bethlehem, Pa. Ask for Booklet 311.



Here's a typical use for Bearcat — general purpose dies requiring a high degree of toughness. These dies are used to produce aluminum impact extrusions.

Here's Good News for

U·S·S Free-Machining MX

is now available in OPEN HEARTH as well as BESSEMER

screw machine operators

The fact has been amply demonstrated that you can produce more parts per hour, that you can prolong tool life, minimize rejections, readily hold to tolerances and obtain better part finish by using MX screw stock.

In the past three years, the hundreds of shops that have put this faster-cutting bar stock into production have proved that MX will reduce the cost of *any* part by out-performing ordinary screw stock.

Such cost savings have averaged between 10 and 15%, sometimes ran as high as 40%. Today, you can confidently count on still bigger savings by using this steel.

And make a note of this. Now MX is also being produced in our Open Hearths to give screw machine operators a freer-cutting steel of the C-12XX type. This steel, especially controlled to improve cold-drawing characteristics, assures users of a fast-cutting bar stock not only of *excellent* surface quality but one that performs exceptionally well when finish-machined parts must be subjected to crimping or other deforming operations.

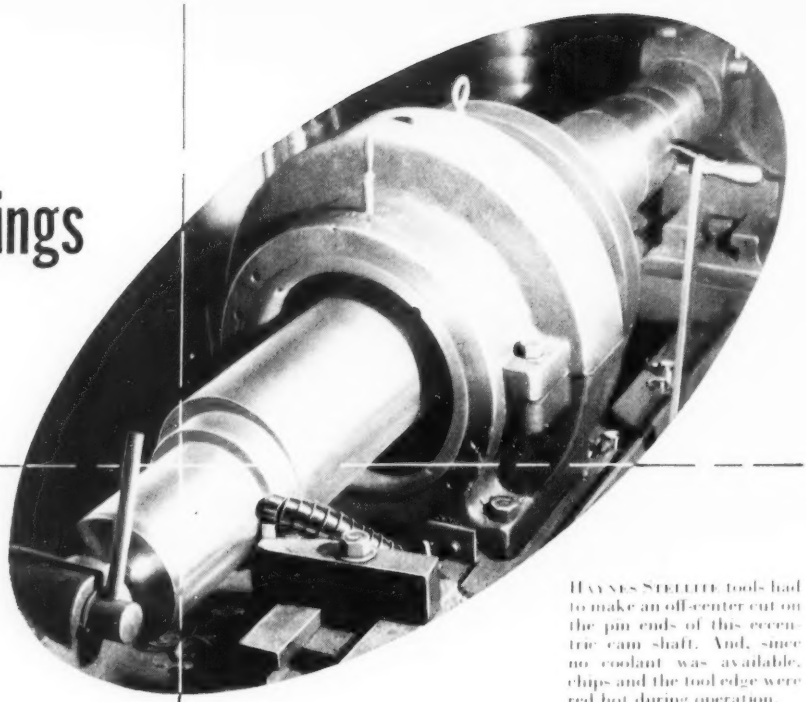
U S S Free-Machining MX—either Open Hearth or Bessemer—is available in all the popular bar sections and sizes. You can obtain it in cold-finished form from your regular supplier as "MX" or under his own identifying trade name. In hot rolled form, MX is available direct through our nearest district sales office.



UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL

Off-Center Forgings



HAYNES STELLITE tools had to make an off-center cut on the pin ends of this eccentric cam shaft. And, since no coolant was available, chips and the tool edge were red hot during operation.

MACHINED FAST...

WITH UNAVOIDABLE CHATTER and NO COOLANT

Even though the conditions on this job were unusual, the results give a good idea of the efficiency of HAYNES STELLITE tools. The workpiece was an eccentric gyrator shaft, forged from SAE 4340 steel, with a Brinell hardness of from 240 to 265. This 7-foot shaft vibrated during machining. And, since the shaft was driven at the eccentric cam section and the journal ends machined on offset centers, it was impossible to machine the journals without taking a severe intermittent cut. No coolant was available. Chips and the cutting edge of the tool were red hot.

HAYNES STELLITE tools did this job twice as fast as the material previously used. They had both the red hardness necessary to speed up the operation and the toughness to take the intermittent cut. With a feed of $\frac{5}{8}$ in. per min., and a depth of cut varying up to $\frac{11}{16}$ in., the tools removed nearly 13 cubic inches of metal per minute from the forgings.

This combination of excellent red hardness and good impact strength in cutting tools may be the answer to your own particular machining problem. For further information, get in touch with the nearest Haynes Stellite Company Office. Ask for a copy of the new manual-catalog, "HAYNES STELLITE Metal-Cutting Tools." It tells the whole story of HAYNES STELLITE cobalt-base tool alloys.

HAYNES
TRADE-MARK
alloys

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation

For more information on products advertised, use Inquiry Card, page 247

HOW GRAPH-MO® HOLLOW-BAR CUTS COSTS OF RING-SHAPED TOOL STEEL PARTS

1 MACHINES 30% FASTER

Free graphite in Graph-Mo's* structure cuts machining time 30% over other tool steels. It has a minimum tendency to pick up, scuff, seize or gall. It's also the most stable tool steel ever made. A typical Graph-Mo steel master plug showed less than 10 millionths of an inch dimensional change in 12 years!

2 ELIMINATES DRILLING

With Graph-Mo Hollow-Bar, drilling is eliminated because the center hole's already there. Finish boring is the first step. You save machining time. Available in sizes up to 16″ O.D. with a variety of wall thicknesses.

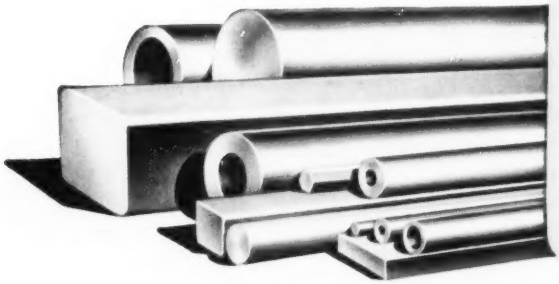
3 OUTWEARS OTHERS 3 TO 1

The combination of free graphite and diamond-hard carbides gives Graph-Mo unusual wear-resistance. Reports from users prove it outwears other tool steels an average of 3 to 1. And Graph-Mo responds uniformly to heat treatment.

4 MORE PARTS PER TON

You start closer to your finished product with Graph-Mo Hollow-Bar. You machine away a minimum of steel, cut scrap loss. Graph-Mo Hollow-Bar is distributed through A. Milne and Co. and Peninsular Steel Co. warehouses. For more information about Graph-Mo Hollow-Bar, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO."

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



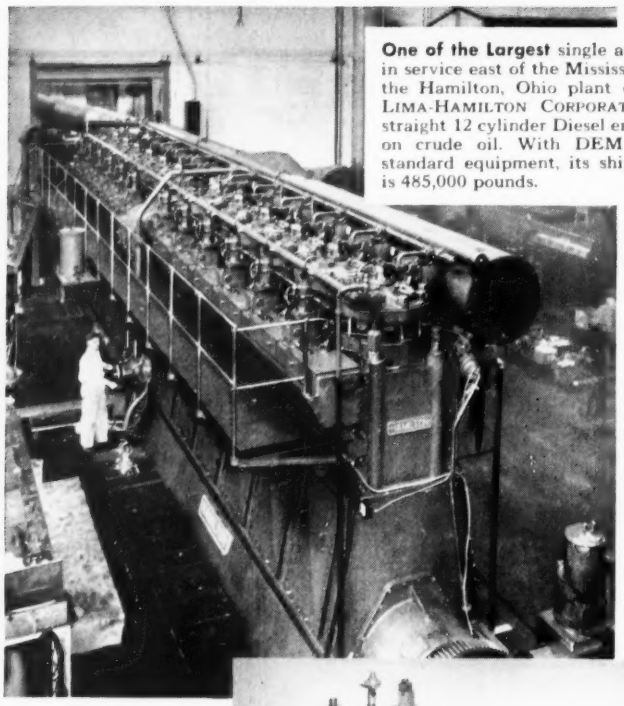
TIMKEN

TRADE-MARK REG. U.S. PAT. OFF.

Fine Alloy

STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



One of the Largest single acting engines in service east of the Mississippi. Built at the Hamilton, Ohio plant of BALDWIN-LIMA-HAMILTON CORPORATION, it is a straight 12 cylinder Diesel engine running on crude oil. With DEMA stationary standard equipment, its shipping weight is 485,000 pounds.

Nickel Alloys Help build stamina into an Engine that serves a city

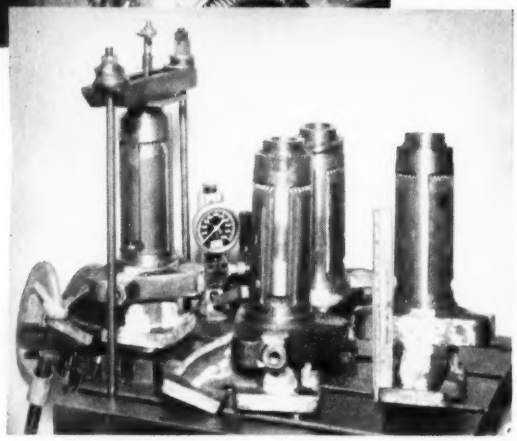
Built to handle the main power load for the city of Decatur, Indiana, this unit shows how nickel alloyed steels and irons are used in advanced design for increased power, quieter operation and longer trouble-free life.

Its forged crankshaft gear ... specified in Type 4340 or 9845 nickel alloyed steel ... provides:

Tensile strength	140,000 psi minimum
Yield Strength	118,000 psi
Elongation	16%
Reduction in area	45%
Brinell hardness	280 to 310

Piston heads are cast in high strength nickel-chromium iron to withstand heat stresses. Cylinder liners are one-piece castings containing .50% to .75% nickel and .25% molybdenum, for resistance to both heat and wear. Carburized nickel-molybdenum steel, Type 4615, is ordinarily specified for cams and rollers, and wrist pins are of Type 8620 nickel-chromium-molybdenum steel.

Consult us on the advantages of nickel in your products or equipment. Send us details of your applications for our suggestions.



Ductile Iron Gas Valve Bodies for HAMILTON Diesel engines undergo an 800-pound pressure test prior to assembly. Steel jackets are welded to these bodies with Ni-Rod 55. The castings are stress relieved for four hours, at 1200° F., and placed in service at 240 BHN. The Ductile Iron bodies prove sounder than those of cast steel, are easier to machine, and combine ample strength and ductility to withstand sudden pressure overloads.

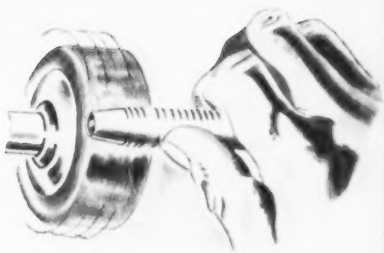
At the present time, nickel is available for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.

INCO

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y

For more information on products advertised, use Inquiry Card, page 247





Mechanical Finishes

. . . polished, buffed, scratchbrushed, burnished.

Aluminum screw machine parts take all finishes

Add to low cost and ease of machining another advantage of aluminum screw machine stock . . . better finishes. Fittings and fasteners are often anodized to increase their resistance to corrosion and abrasion. Component parts for appliances are frequently plated for high luster and better match with other parts. Burnishing is usually used for bulk finishing of small parts such as smoking pipe parts. Finishes can be applied to aluminum by most mechanical and chemical processes. Aluminum can be painted and electroplated using standard equipment and procedures. And, of course, it can be anodized to any color of the rainbow.

Your local Alcoa sales engineer will answer your questions on finishing and machining procedures. You'll find him listed under "Aluminum" in your classified phone book. Aluminum Company of America, 870-M Alcoa Building, Pittsburgh 19, Pa.



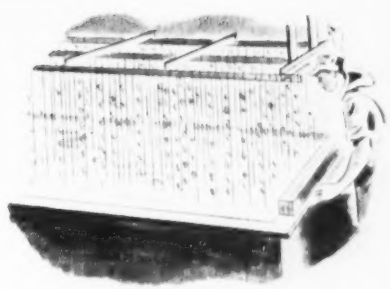


ALCOA OFFERS TWO BOOKS—*Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques.

Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

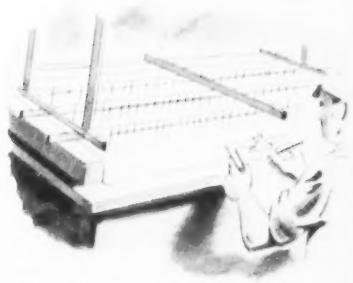
BASIC ECONOMICS FOR BUYERS

While you buy screw machine stock by the pound, you machine it by the foot. A pound of aluminum gives you three times more feet of stock than a pound of brass or steel.



Chemical and Electrochemical Finishes

. . . frosted, etched and anodized for unusual effects in color—for extra corrosion resistance—for better paint adhesion.



Electroplated Finishes

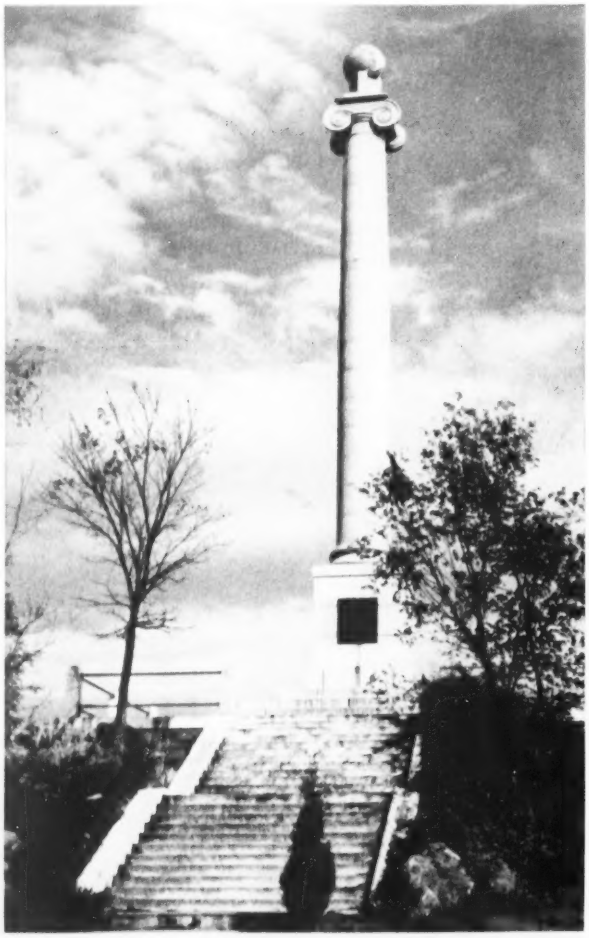
. . . chromium, copper, nickel, gold, silver and brass.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

CUMBERLAND GROUND BARS

We manufacture 8" diameter, 7-1/2", 7", 6-1/2", 6", and also odd and intermediate sizes down to and including 1-1/8".

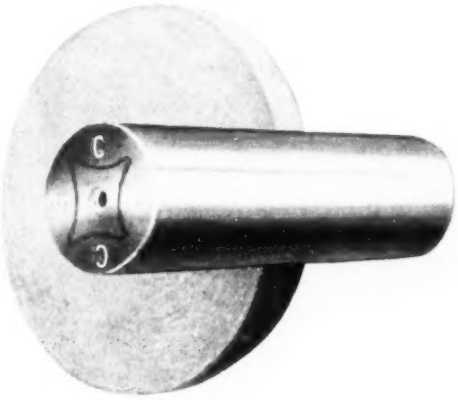


ON THE WEST VIRGINIA SHORE, OVERLOOKING THE POTOMAC RIVER, STANDS THE JAMES RUMSEY MONUMENT

The first practical steamboat in the world was run on the Potomac River a few miles below Cumberland, Maryland.

GEORGE WASHINGTON said in his diary, under date of September 6, 1784: "Remained at Bath all day and was shown the Model of a boat constructed by the ingenious Mr. Rumsey, for ascending rapid currents by mechanism; the principles of this were not only shown, and fully explained to me, but to my very great satisfaction, exhibited in practice in private under the injunction of secrecy—."

At a later date GEORGE WASHINGTON said in his diary: "Spent the afternoon with Mr. Rumsey and then Alexander Hamilton and I rode on to Cumberland, Maryland."



Symbol of Quality

Approximately 100 years after the exhibit of this steamboat, Cumberland began grinding bars. They found through experience this was the best method by which accurate steel bars could be produced. These bars are so carefully ground that they are adapted for mass production where gears, pulleys, sprockets and bearings must slide on the bars without delay due to filing or fitting.

IMMEDIATE BARS

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Baltimore, Maryland—Addison Clarke & Bro.
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Buffalo, N. Y.—Jos. T. Ryerson & Son, Inc.
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Worcester, Mass.—Pratt & Inman

CUMBERLAND STEEL COMPANY

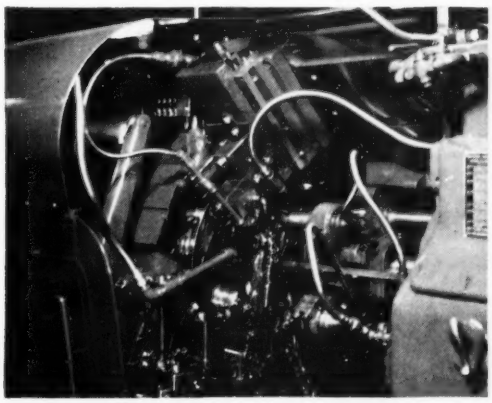
CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 INCORPORATED 1892

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Free-Machining ENDURO STAINLESS STEEL BARS ...two Grades

(A.I.S.I. 416 and 430-F)

Fully 90% As Machinable As Bessemer Screw Stock



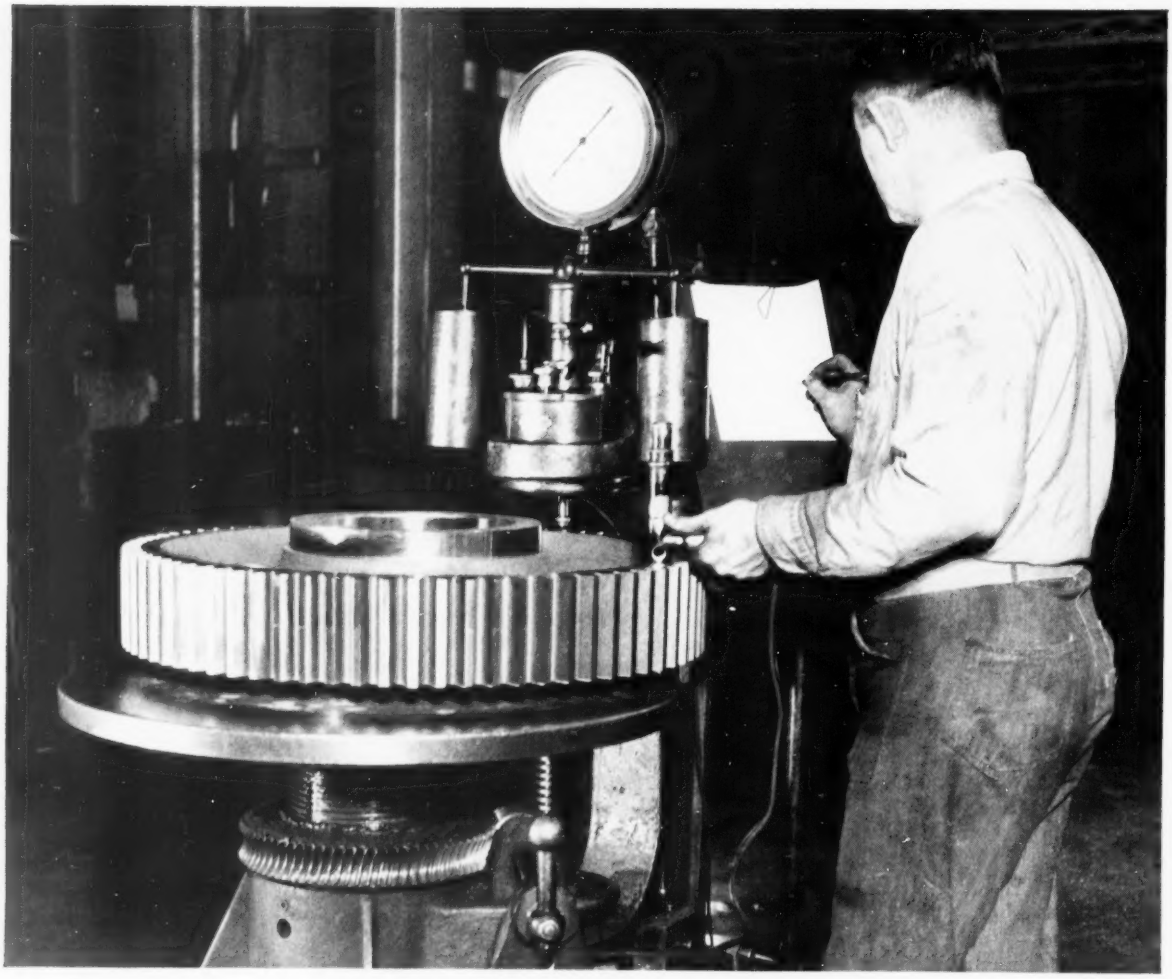
You can give duplicate steel parts added strength and increased corrosion-resistance . . . and still get economical automatic production. Convert to Free-Machining ENDURO Stainless Steel bars. They're cold-finished by Republic's Union Drawn Steel Division to give you close tolerance, accuracy of section, uniform soundness and fine surface finish . . . plus the high physical and chemical properties of stainless steel. Two grades are fully 90% as machinable as regular Bessemer screw stock. Free-Machining ENDURO is also available in hot-rolled bars and wire. Republic metallurgists give prompt assistance on applications, processing and use. Write:

REPUBLIC STEEL CORPORATION
Alloy Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic ENDURO® FREE-MACHINING STAINLESS STEEL

REPUBLIC STEEL

Other Republic Products include Carbon and Alloy Steels—Pipe, Sheets, Strip, Plates, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing



Checking a locomotive spur gear at one of the great General Electric plants.

Back of Every Good Gear Is a Good, Strong Blank

Big gears for diesel locomotive service have to run a gantlet of inspections and approvals by metallurgists, engineers, and machine-shop technicians. When products of this sort have been passed, no one can ever doubt their fitness.

The basis of a good gear is a good blank. Today, makers of top-quality locomotive gears are protecting their customers and reducing their scrap by using Bethlehem forged-and-rolled blanks for spur gears in traction motor drives. These same manufacturers report that the blanks are economical in first cost, sound metallurgically, and easy to machine.

Have you tried these forged-and-rolled blanks in your own operations? If not, there is no better time than right now. You'll find them ideal not only for gears, but for crane and sheave wheels, flywheels, turbine rotors, industrial wheels, tire molds, and other parts where high strength without excessive weight is required. They are available in a wide range of sizes — 10 to 42 in. OD — and they can be furnished heat-treated or untreated, as you prefer.

Write for a free copy of Booklet 216. Lavishly illustrated, it will suggest many ways in which these sturdy, reliable blanks can ease design and production problems.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

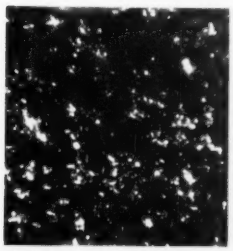
BETHLEHEM FORGED-and-ROLLED CIRCULAR BLANKS

Heavy Zinc Phosphate Coatings for Steel

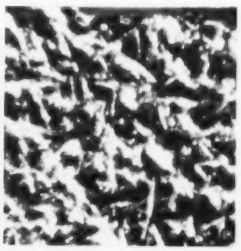
In developing the Oakite CrysCoat HC* Process—which converts a steel surface into a continuous coating of complex metal phosphates—the chemists of the Oakite Research Laboratory made use of a chemical reaction which conquered some of the major obstacles that interfered with the success of older phosphating processes.

The primary aims of this research were to produce a phosphate coating that would provide a good foundation for paint and would give the steel reliable protection against electrochemical corrosion.

These aims were realized with a coating—composed principally of zinc phosphates—that weighs more than 200 milligrams per square foot, thus exceeding the requirements of U.S. Government Specifications JAN-C-490, Grade 1; 57-O-2C, Type 2, Class C and PA-PD-191, Rev. A. In regard to corrosion, the test panels usually run well over 500 hours in the salt spray chamber without showing any signs of blistering or peeling in the types of paint ordinarily used in ordnance production.



Without a phosphate coating, cold-rolled steel possesses poor paint-bonding characteristics and no protection against electrochemical corrosion.



This CrysCoat HC coating of phosphate crystals protects against corrosion and provides an excellent foundation for paint. Magnified 67.5 times.

Secondary aims of the research were to develop a process that would produce little sludge and scale, that would not require overly expensive equipment and that would be easy to control.

While all of these aims were accomplished, the most remarkable gains were made in the field of control.

Perhaps the best way to describe the simplicity of the Oakite CrysCoat HC Process is to say that it requires no skilled chemist to serve as baby-sitter.

Only one material—the liquid called Oakite CrysCoat HC—is used in the phosphating stage. No other material—such as accelerator, starter, toner or other additive—is used for making up the solution or for keeping up its concentration.

Only one type of titration is needed to keep the CrysCoat HC process under control and there is no need for regular determination and adjustment of pH.

More information about the simplicity and reliability of the Oakite CrysCoat HC Process is given in a 12-page, illustrated booklet titled *"How to apply better zinc phosphate coatings to steel in preparation for painting."* To obtain a free copy, mail the coupon at the right.



At Consolidated Industries, Lafayette, Ind., Superintendent Edwin Everhart and Oakite Technical Service Representative Walter Sittman watch part of a disposable gas tank go into the CrysCoat HC solution.

*HC means Heavy Coating

Advertisement



*This comment came from a Pennsylvania munitions maker, who added that Oakite CrysCoat HC has put an excellent zinc phosphate coating on 385,000 shells with "absolutely no trouble . . . maintenance and control are very easy."

The Oakite CrysCoat HC coating on steel products—such as artillery shells, rocket fins, auto parts, etc.—weighs more than 200 milligrams per square foot. It more than meets the requirements of U. S. Government Specifications:

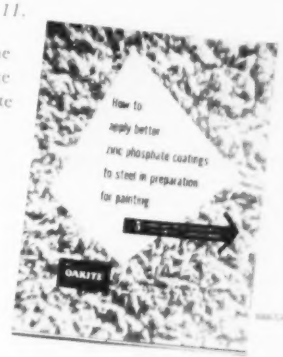
JAN-C-490, Grade 1 **57-O-2C, Type 2, Class C**

PA-PD-191, Rev. A

The Oakite CrysCoat HC Process for preparing steel for painting—either in spray-washing machines or in tanks—has five big advantages:

1. The heavy CrysCoat HC coating forms a strong foundation for the lasting adhesion of paint. *See page 5 in free booklet.*
2. The heavy coating gives excellent protection against electrochemical corrosion. *See page 7.*
3. The CrysCoat HC Process is easy to control. Only one material is used for make-up and up-keep. No accelerators, starters, toners or other additives are needed. Only one simple type of titration is used. *See page 9.*
4. The CrysCoat HC reaction produces relatively little sludge and scale. *See page 10.*
5. Stainless steel is not necessary for all parts of the equipment. *See page 11.*

FREE For complete information, mail the coupon for a copy of our 12-page illustrated booklet describing the Oakite CrysCoat HC Process.



SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada

OAKITE PRODUCTS, INC.
26 Rector St., New York 6, N. Y.

Send me a FREE copy of *"How to apply better zinc phosphate coatings to steel in preparation for painting."*

Name _____

Company _____

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They BRING HELP QUICKLY!

Bunting Standard Stock Bearings

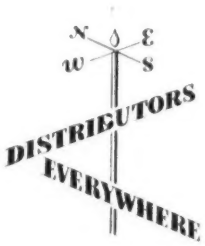


A phone call to your nearest local Bunting Distributor will bring you immediately a few or many completely machined and finished Bunting Bronze Standard Stock Bearings for production or maintenance of machine tools and plant machinery of all kinds. No further finishing is required in most cases—wide range of sizes meets practically every need. They are always in stock, awaiting your order.

The Bunting Distributor



Your Bunting Distributor is an industrial distributor or a specialist in certain industrial items. You will find him listed in the classified section of your telephone book—most likely under the heading Bars, bronze or Bearings, bronze. If he is the leading distributor, he almost certainly is the Bunting Distributor. He carries in stock, for your money saving convenience, completely machined and finished Bunting Standard Stock Industrial Bearings, Electric Motor Bearings and Precision Bronze Bars in a complete range of sizes meeting all your usual production and maintenance needs. Ask him for catalog.



Bunting®

BRONZE BEARINGS • BUSHINGS • PRECISION BRONZE BARS

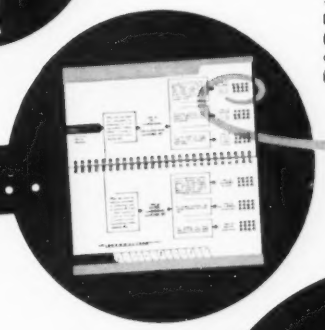
THE BUNTING BRASS & BRONZE COMPANY • TOLEDO 1, OHIO • BRANCHES IN PRINCIPAL CITIES

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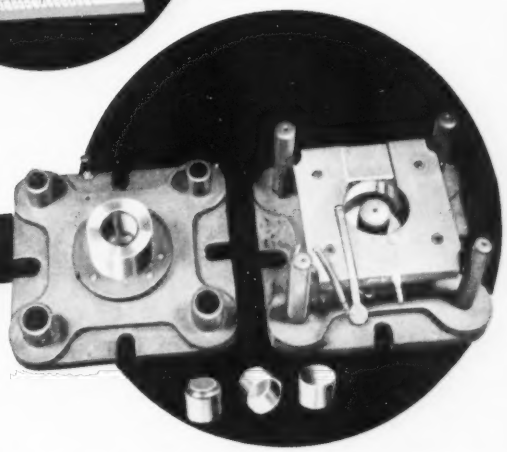
How ONE TOOLMAKER . . .



USED THIS GUIDE . . . . . —then use HAMPDEN (Oil-Wear) or No. 610 (Air-Wear)



TO HOLD DOWN UNIT COSTS . . .



AT which step in your tooling process would you welcome real help in reducing tool and die costs? Tool Steel Selection? Heat Treating?—or on-the-job "Trouble-Shooting"? Here's how you, like the maker of the Dies shown here, can start to reduce costs with a Method that helps you at *all 3* steps.

First, to simplify selection, use the handy Selector Section in the Carpenter Matched Tool Steel Manual. Quickly and surely, it enables you to put your finger on the proper steel for best results. Next, to further insure tool and die performance, use the Manual's complete heat treating instructions—they have been simplified beyond anything previously known. It's easy to get started—use the Carpenter Matched Set Method to help you "trouble-shoot" your present tool and die jobs.

For better, lower-cost tooling, put this practical, easy-to-use Method to work, now. Ask for the 189-page Carpenter Matched Tool Steel Manual—just see your Carpenter representative. The Carpenter Steel Company, 105 W. Bern Street, Reading, Pa.

Job:
Compound Blank and Draw Die for forming .031", ¼-hard brass Vent Valve Bodies at the rate of 103 per minute on a punch press.

Problem:
Unit costs were on the upswing because the old dies wore too rapidly, causing frequent and costly machine shutdowns for regrinding.

Solution:
Looking for a die steel with maximum wear resistance, the toolmaker referred to the Selector Section in the Carpenter Matched Tool Steel Manual, and quickly arrived at Carpenter *Hampden* (Oil-Wear).

Heat Treatment:
Simplified instructions in the Manual were followed.

Results:
2 hours of costly machine downtime were eliminated *each day*—production per grind *rose over 300%!* As a matter of interest, the toolmaker takes off approximately .0005" per stoning and gets about 100 grinds from the Blank and Draw Die.

IMMEDIATE DELIVERY FROM LOCAL STOCKS!

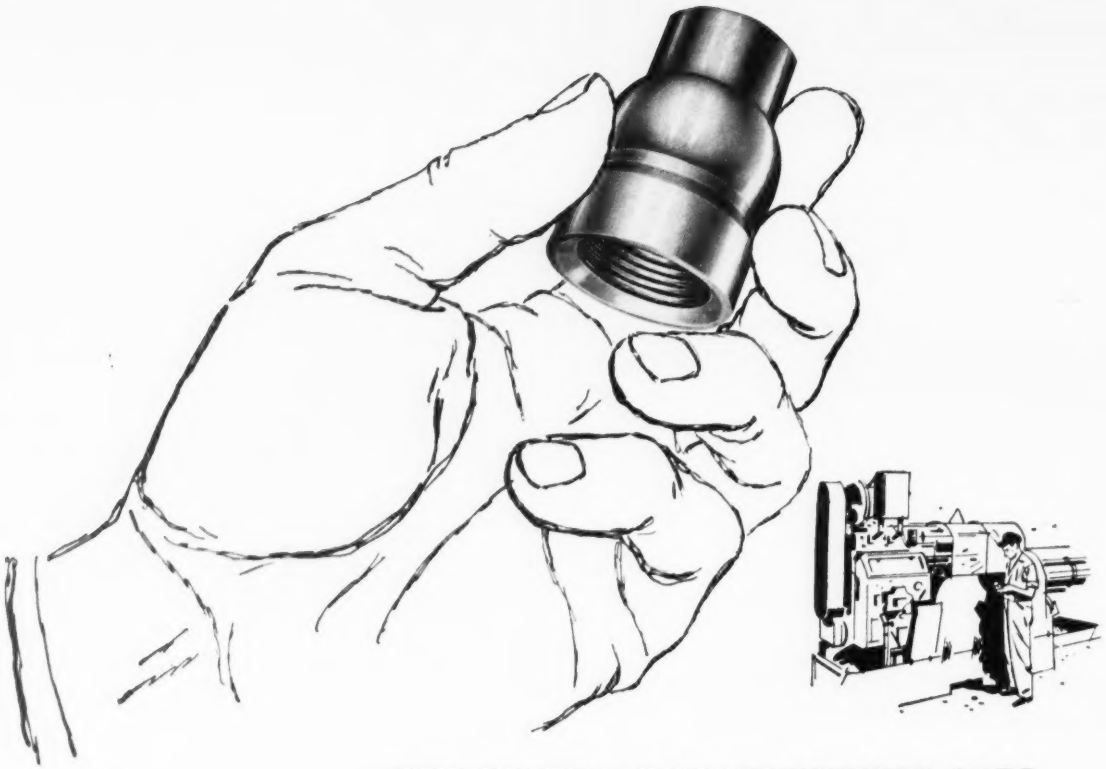
Call Your Nearest Carpenter Warehouse or Distributor

Carpenter

Matched Tool and Die Steels

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Mill-Branch Warehouses and Distributors in Principal Cities Throughout the U. S. A. and Canada



PRE-TESTED MACHINABILITY GETS AUTOMATICS INTO PRODUCTION ...FASTER

● That's why we make this test part in our own plant at Massillon, Ohio. It embodies the six most common automatic operations. By studying it, we discover how to make Union Drawn Steels even better for automatics. More free-machining. More profitable for you. When the part has served its purpose for research, we scrap it.

When you know how a steel will behave *before* you put it on your automatics, you save a lot of headaches. You get set up sooner, using the best combinations of feeds and speeds. There are more parts in the pan, fewer in the reject box. Production is maintained. So are profits. Sometimes they're increased.

And just to make sure you get the most out of the Union Drawn Steels you buy, one of our metallurgists or machining engineers will be glad to talk to your set-up man. Swapping hints on tool angles, heavier feeds and speeds, they can often come up with the best ways to run Union Cold Drawn Steels. When shall we call?



6 HELPFUL MANUALS

filled with how-to-do-it information and data to help you use Union Cold Drawn Steels. Write for "Union Drawn Pocket Library."

●

Free-Machining Bessemer, Alloy and Enduro Stainless Steels

Union Cold Drawn Special Sections

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting.)

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Republic UNION® COLD DRAWN STEELS

REPUBLIC STEEL

For more information on products advertised, use Inquiry Card, page 247



sales

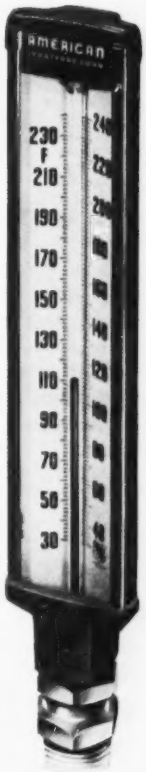
Bronze Extrusion makes a stronger case for this industrial glass thermometer

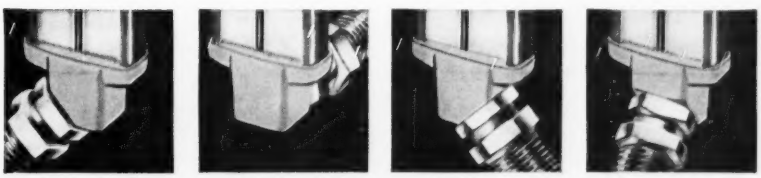
The case for this "American" Industrial Glass Thermometer made by Manning, Maxwell & Moore, Incorporated, Stratford, Conn., used to be a steel stamping. Now it's made of ANACONDA Extruded Bronze.

Why the change? Because this extruded bronze shape makes a far stronger and more rigid case; it's easier to produce; it simplifies assembly—and adds additional quality to an already high-quality product. So accurate are these bronze extrusions that neither straightening nor machining is needed for assembly. And assembly time itself is cut.

For the base, an ANACONDA Brass Die Pressed Forging is joined to the case by brazing to provide greater joint strength. By machining the appropriate face of a single-style base forging, a stem connection can be provided at any angle.

ANACONDA Brass and Bronze have long been making a stronger "case" for products—by simplifying production; by the higher quality that is always associated with products made of brass or bronze; by increasing sales appeal. We urge you to consider the advantages of these metals for your manufacturing processes and your products. For information, write to The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.







Base forging can be machined to provide stem connection at any angle and direction.

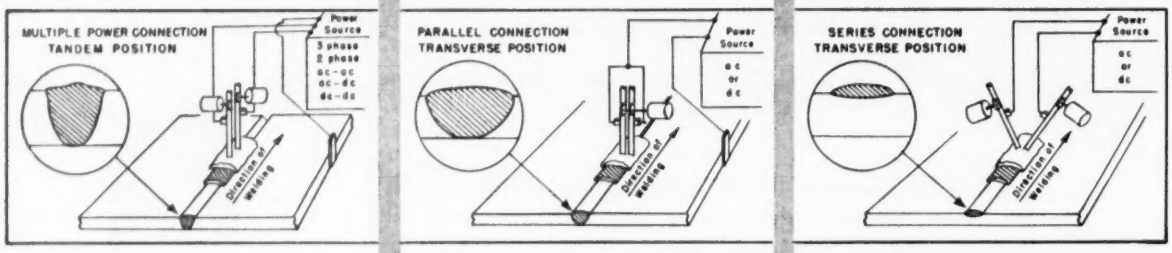
Extruded case and forged base for this 9-in. "American" Thermometer are joined in perfect alignment by brazing. No machining or straightening is required.

ANACONDA®—the name to remember in COPPER—BRASS—BRONZE

CUT YOUR WELDING TIME IN HALF *with* UNIONMELT Multiple Electrode Welding

UNIONMELT Multiple Electrode welding with two or more electrodes in tandem, transverse, or other positions increases welding speeds up to three or four times faster than single electrode welding.

By using two or more electrodes in the same weld zone, magnetic reaction can be regulated to provide exceptional control over arc direction and weld shape.



Extra High-Speed Welds are made with multiple power connection and the electrodes in the tandem position. Speed is three to four times that of single electrode welding. This is particularly suited for welding long continuous seams, well-prepared and well-fitted, as in pipe, tanks, pressure vessels, and structural assemblies.

Extra Wide, High-Speed Welds are made with parallel power connection and the electrodes in the transverse position. Speed is twice as fast as for single electrode work. This is particularly useful for welding seams with gaps or other irregularities, as in center sills, ship plate, and heavy, hard-to-fit work.

Extra Shallow, Wide Welds are made with the series power connection and the electrodes in the transverse position. Speeds are many times faster than single electrode work and the dilution of the deposit is far lower than can be produced with a single electrode. This process will open new possibilities for surfacing and cladding all kinds of articles by automatic welding.

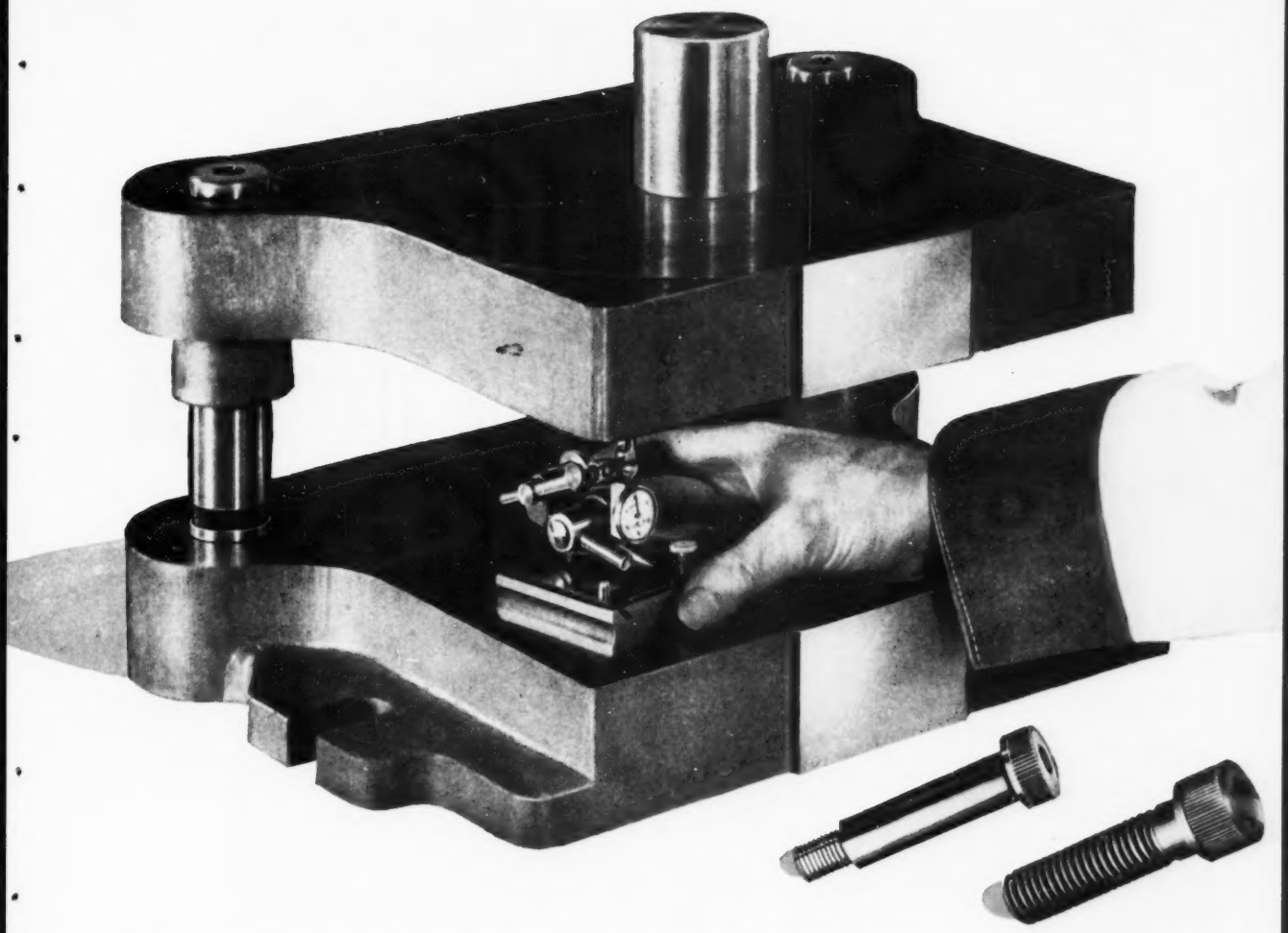
Complete UNIONMELT machines are available for multiple electrode welding and all UNIONMELT apparatus is designed for easy installation in any plant or factory. LINDE's engineers will be glad to determine how UNIONMELT Multiple Electrode Welding can best benefit you. Call your nearest LINDE office for more details on UNIONMELT Multiple Electrode Welding.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

Linde TRADE-MARK

The terms "Linde" and "Unionmelt" are registered trade-marks of Union Carbide and Carbon Corporation.

For more information on products advertised, use Inquiry Card, page 247



DIEMAKERS DEPEND ON DANLY FOR DIE SET ACCURACY

When it comes to meeting the precision requirements of the finest die work, diemakers everywhere *depend on Danly* Die Sets and Danly Diemakers' Supplies for accuracy. Precision machining, grinding, lapping and honing provide smooth, long-wearing surfaces with dimensional accuracy held within extremely close tolerances. On every component part, rigid inspection standards guard Danly quality.

Danly accuracy saves countless hours in the die shop, makes tooling-up much faster, insures longer production runs at lower cost. Why not bring Danly into your diemaking plans and get the results you're looking for. Remember, there's a Danly Branch near you. They're stocked for immediate delivery.

Call Your Local Danly Branch Today!

***CHICAGO** 50—2100 S. Laramie Ave.
***CLEVELAND** 14—1550 East 33rd St.
***DAYTON** 7—3196 Delphos Ave.
***DETROIT** 16—1549 Temple Ave.
***GRAND RAPIDS** 113 Michigan St., N.W.
INDIANAPOLIS 4—5 West 10th St.
***LONG ISLAND CITY**—47-28 37th St.
***LOS ANGELES** 54—Ducommun Metals & Supply Co., 4890 South Alameda
MILWAUKEE 2—111 E. Wisconsin Ave.
***PHILADELPHIA** 40 511 W. Courtland St.
***ROCHESTER** 6—33 Rutter St.

**Indicates complete stock*



For more information on products advertised, use Inquiry Card, page 247



Here's another reason it pays to get a proposal from Fosdick

We hold spindle runout to

Less than .0002" runout at the end of a 12" proving bar! That's one of *many* rigorous tests every Fosdick Jig Borer must pass before it leaves our shop. These tests are your assurance, and ours, that you will get true precision... as good as *or better than* any Jig Borer will deliver—regardless of price! This machine is available with Automatic Positioning which enables you to locate holes to ± .0001", quickly and without need for highly-skilled operators.

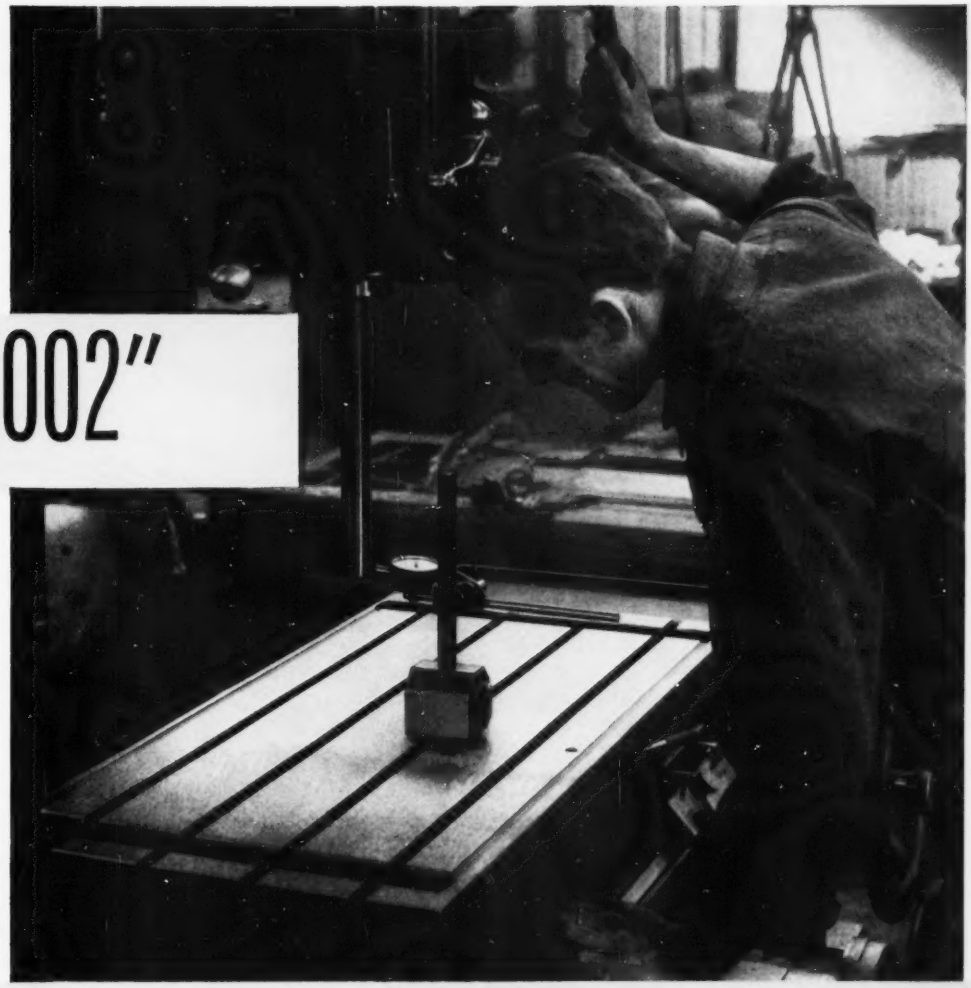
For full description of the Fosdick Jig Borer, ask for Bulletin JBM.



to give you

Precision Drill Head Boring Speeded by Automatic Positioning

Boring this four-piece 28-spindle drill head housing is a tough job in any man's shop. All bores have to be held to ± .0002". Further, all back boring on spindle locations must be within .0001" for alignment because any error multiplies 5 times or more at the drill point. For jobs like this, Fosdick's Proposal to the R. & B. Tool Co. of Saline, Mich., called for a 42-P Jig Borer with Automatic Positioning. In the first four weeks after R. & B. received the machine, they completed seven sets of the housing illustrated. Each included 139 holes charted, roughed and finish bored. Each, with a total of 528 machine positions, *required only 38 hours to complete.* Ten hours less, R. & B. estimates, than if they'd used a machine without automatic positioning!



precision boring like this

Need Drilling Equipment? Get a Proposal from Fosdick!

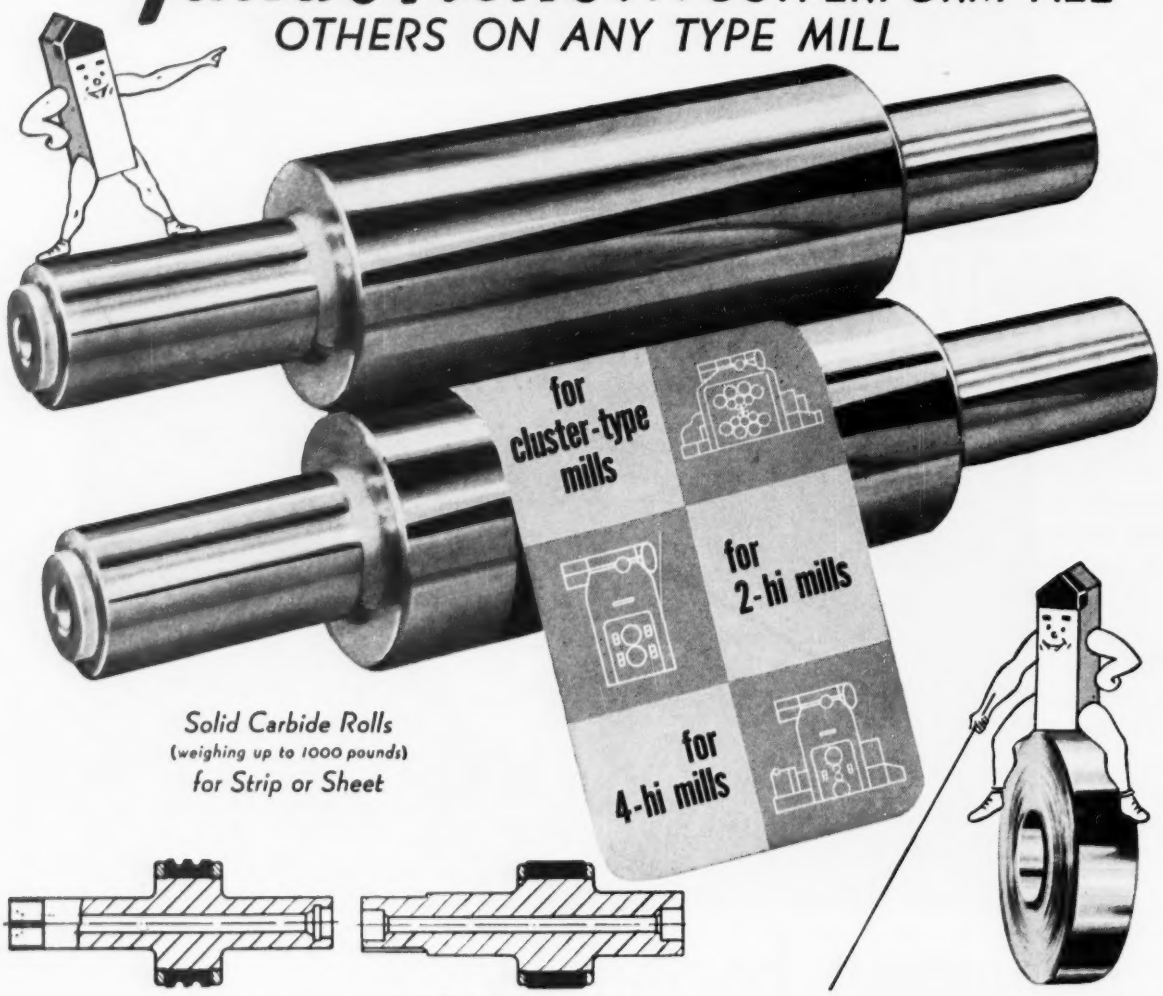


Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Talide Rolls... OUTPERFORM ALL OTHERS ON ANY TYPE MILL



Solid Carbide Rolls
(weighing up to 1000 pounds)
for Strip or Sheet

FOR SHAPE WIRE

SLEEVED ROLLS FOR FLAT WIRE

Solid Talide Carbide Rolls are generally used for cold rolling carbon, alloy, spring, razor, silicon, stainless and other analyses of strip steel. They are being used satisfactorily as either idle or driven rolls. For cold rolling flat or shape wire from round wire, or when rolling metal tinsel or ribbon, a carbide sleeve is usually press fitted to a steel arbor. Talide Rolls can be produced in diameters up to 24" and lengths up to 40".

There are actually 14 specific advantages obtained in operation and product by using Talide (Tungsten Carbide) Rolls. Chiefly, Talide Rolls outlast steel rolls from 50 to 1 on low carbon steel to 15 to 1 on high alloys and stainless. You can make greater reductions per pass, operate at higher speeds and impart a smoother, brighter finish. Blanking die life is increased and plating costs reduced. Metal Carbides Corporation, Youngstown 7, Ohio.

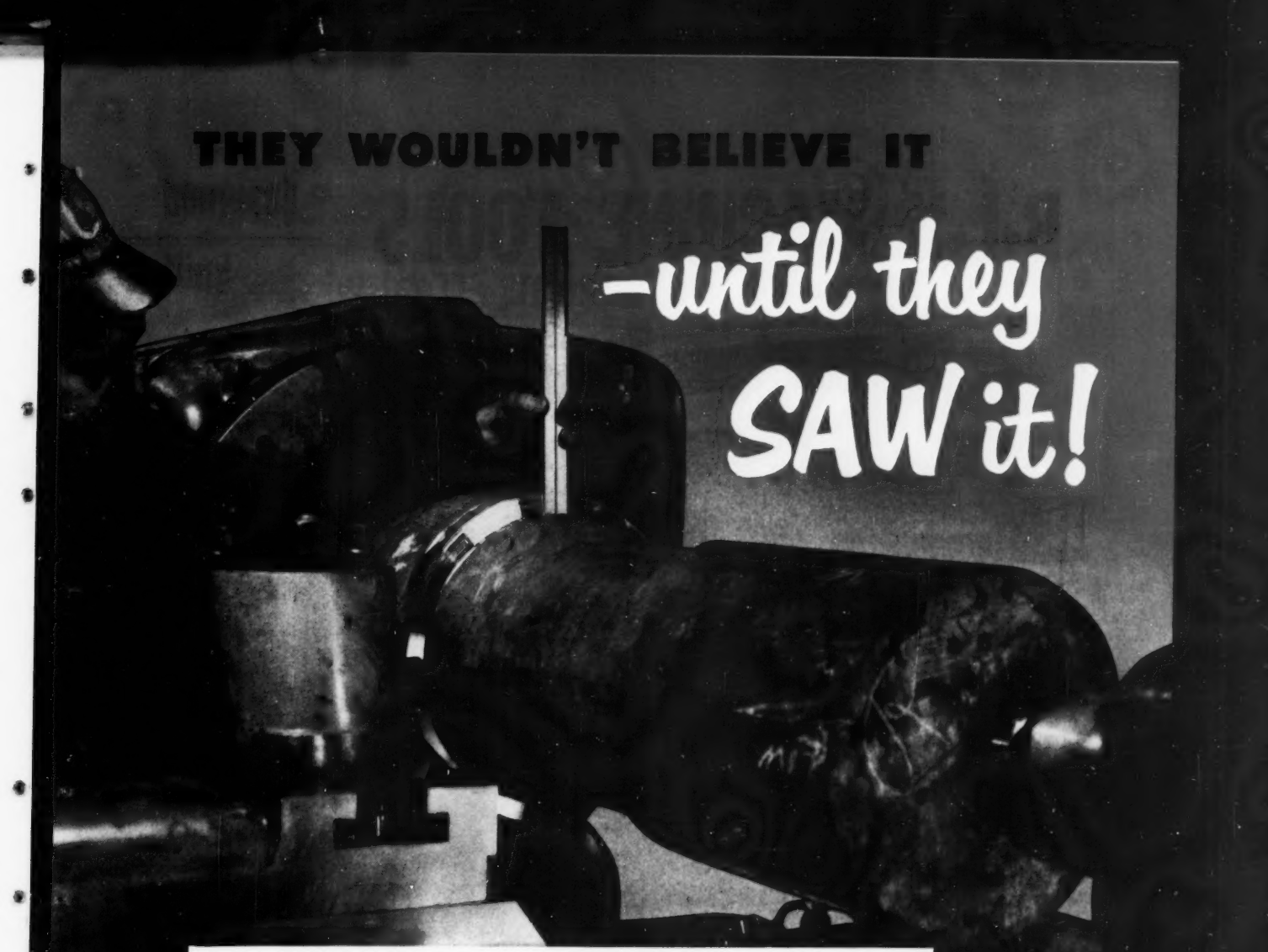


Ask for our Talide Roll Catalog CR-50

METAL CARBIDES CORPORATION
MC
TALIDE
YOUNGSTOWN 7, OHIO

SINTERED CARBIDES · HOT PRESSED CARBIDES
TUNGSTEN ALLOY HEAVY-METAL
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

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THEY WOULDN'T BELIEVE IT

—until they SAW it!

Seeing was believing for a group of mechanical officials from one of the mid-west's most prominent earth moving equipment builders.

Frankly they just wouldn't believe that the new 32" "AMERICAN" Pacemaker Lathe would effectively use 60 horse power and cemented carbide cutting tools in machining rough alloy steel forgings. So they came to see for themselves and they saw:

1. Cuts 1⅛" deep.
2. Cutting speed 300 feet per minute.
3. .030" feed.
4. 60 to 65 horse power registered by horse power meter during the maximum cuts.
5. Not a shimmy or whimper from the machine.

They were amazed and convinced.

This new model Pacemaker is endowed with the power, stamina and convenience that combine to produce a thoroughly dependable and highly productive unit.

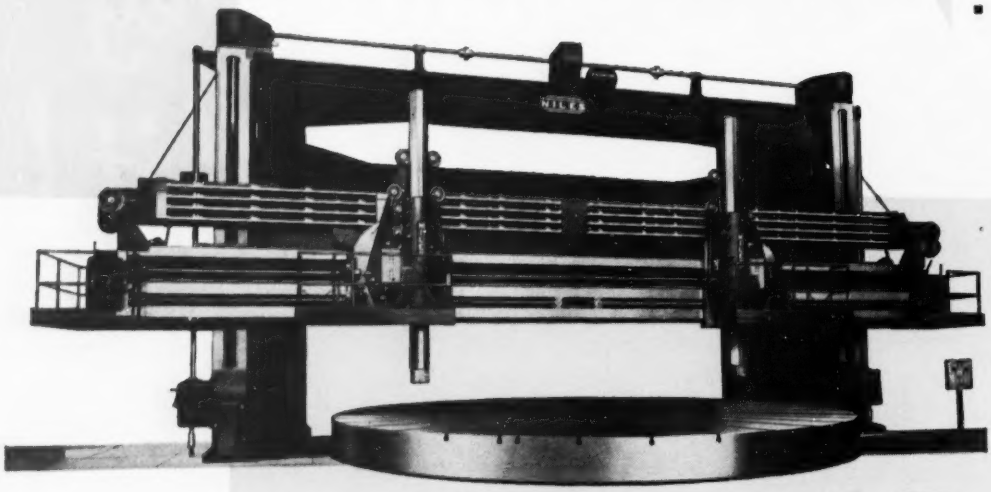
Bulletin No. 44 tells all . . . have one?

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

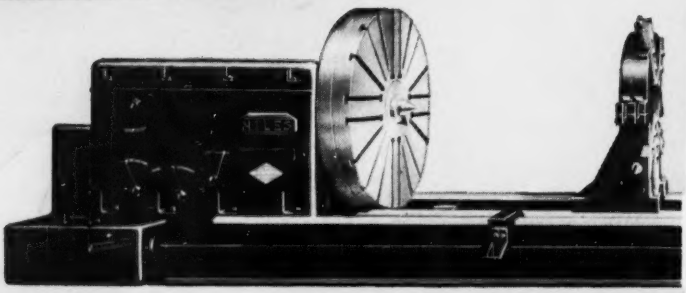
LATHES AND RADIAL DRILLS

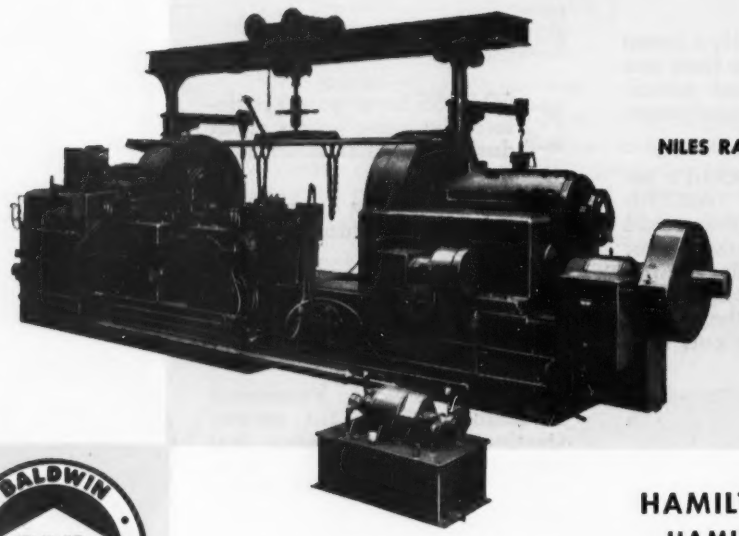
B-L-H MACHINE TOOLS

designed
... built



NILES VERTICAL BORING AND TURNING MILLS— 10' 12' 14' 16' 20' 30' and 43' *(shown above)*





NILES RAILROAD TOOLS— Hydraulic Car Wheel Lathe (at left); End Drive Axle Lathe; Hydraulic Centering Machine; Hydraulic Diesel and Car Wheel Borers; Hydraulic Axle Burnishing Lathe

BALDWIN BLH LIMA-HAMILTON

HAMILTON WORKS
HAMILTON, OHIO

BALDWIN - LIMA

for modern speeds and automation

ruggedly for lasting precision

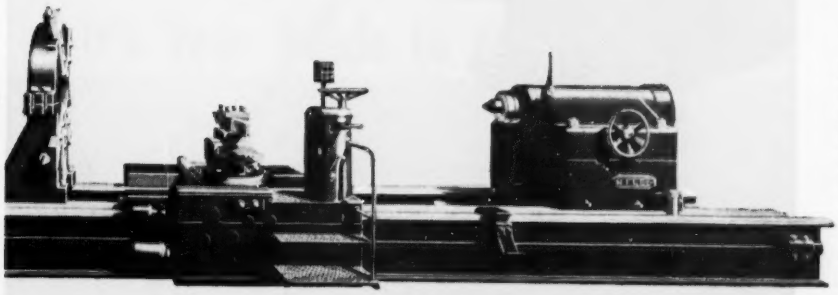
NILES

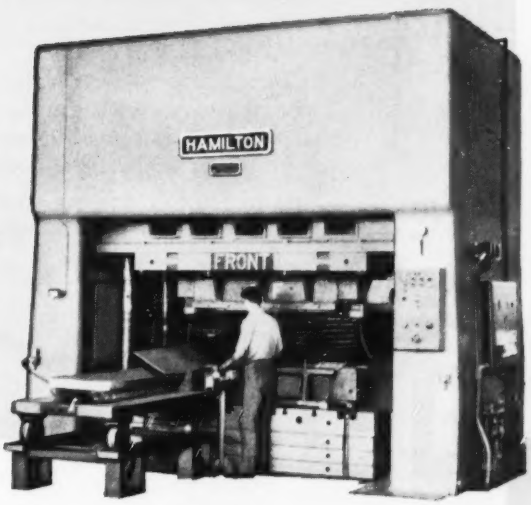
BORING MILLS
ENGINE LATHES
RAILROAD TOOLS

HAMILTON

MECHANICAL PRESSES

NILES HEAVY ENGINE LATHES—
40", 50", 60", 72", 84", 96" and larger sizes





HAMILTON MECHANICAL PRESSES—

single, double and triple action presses for metal forming and stamping; also open back inclinable presses, rail presses, welding presses and die fitting machines.

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Phone—Market 4491

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Kelleher Engineering Corp.
Suite 435—International Trade Mart
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Phone—FA 4385

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J. M. Grisley
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Hallidie Machinery Co.
2726 First Ave., South
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For full information on these B-L-H Machine Tools see our 12-page catalog in Sweet's Machine Tool Catalogs . . . or

***Write* us for your free copy.**

- HAMILTON

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MADISON-KIPP *Fresh Oil*

. . . FED UNDER PRESSURE
BY THE MEASURED DROP



the most dependable method of lubrication ever developed!

This lubricator becomes an integral part of a machine tool in which there are 48 vital bearings that require dependable lubrication. The Madison-Kipp mechanism is so compact that the reservoir measurements are only 4" wide, 19¾" long by 5¾ high."

There are six different models to meet almost every application requirement. Please write us for all details regarding your particular lubricator requirements.

MADISON-KIPP CORPORATION
203 WAUBESA STREET • MADISON 10, WISCONSIN

kipp

• Skilled In Die Casting Mechanics • Experienced in Lubrication Engineering • Originators of Really High Speed Air Tools

For more information on products advertised, use Inquiry Card, page 247



Take two looks at this map...

It's Your Guide to Monarch Sales and Monarch Service

How to buy a Monarch Lathe? Simple! Get in touch with your branch office or distributor (see map above). They'll give you our full story in type and pictures—show you a sound movie of the machines—arrange for job studies, if you wish—plan a field demonstration or a visit for a factory demonstration. If you're not sure which office to contact, write us and you'll find the right man on your doorstep—quick!

How to *get service* for your Monarch? It's just as easy—for the Monarch service plan is second to none in speed and efficiency. Resident factory-trained service engineers are strategically located around the country. Each man travels his territory constantly, demonstrating machines, instructing operators and following installations. He'll be in your plant in a hurry any time he's wanted. Just call your Monarch branch office or distributor.

We've been able to build this topflight sales and service organization only because of the great demand for the Monarch line of proved-in-performance lathes. Challenge us to improve your performance on any turning problem! . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

BRANCH OFFICES

CHICAGO, ILLINOIS. The Monarch Machine Tool Co., 6645 West North Ave., Oak Park, Ill.

CINCINNATI 37, OHIO
The Monarch Machine Tool Co., 7373 Brookcrest Drive, Roselawn Ctr. Bldg., Office C-17.

CLEVELAND 18, OHIO
The Monarch Machine Tool Co., 3091 Mayfield Road.

DETROIT 21, MICHIGAN. The Monarch Machine Tool Co., 16622 James Couzens Highway.

INDIANAPOLIS 5, INDIANA. The Monarch Machine Tool Co., Maco Building, Room 12, 709 East 38th St.

MONTCLAIR, NEW JERSEY. The Monarch Machine Tool Co., 484 Bloomfield Avenue.

PITTSBURGH 22, PENNSYLVANIA
The Monarch Machine Tool Co., 512 Empire Building, Liberty Ave. and Stanwix St.

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ATLANTA 3, GEORGIA
Noland Co., Inc., 512 Spring St., N. W.

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Noland Co., Inc., 2204 First Ave. South.

BOISE, IDAHO
M. R. Priest & Sons, 515 Highland St.

BOSTON, MASSACHUSETTS. Wigglesworth Machinery Co., 199 Bent St., Cambridge 41, Mass.

BUFFALO, NEW YORK. G. W. Brunton and Son, Inc., 2315 Elmwood Ave., Kenmore 17, New York.

CHARLESTON, WEST VIRGINIA
Wm. S. Bolden Co., Inc., 814 East Washington St.

CHATTANOOGA 1, TENNESSEE
Noland Co., Inc., 115 Market St.

DALLAS 19, TEXAS
Greene Machinery Co., 6300 Wyche Blvd.

DAYTON 2, OHIO
C. H. Gasiger Machinery Co., Bacon & McDonough Sts.

DENVER 4, COLORADO
F. J. Leonard Co., 1219 California St., Room 201.

DURHAM, NORTH CAROLINA
George A. Marshall Machinery, 225 Monmouth Ave.

GREEN BAY, WISCONSIN
Bay Verte Machinery Company, 127-131 N. Pearl St.

HOUSTON 1, TEXAS. Steel & Machine Tool Sales Co., 6416 Navigation Blvd., P. O. Box 1716.

KANSAS CITY 6, MISSOURI
Fuchs Machinery & Supply Co., 1823 Walnut St.

LOS ANGELES 58, CALIFORNIA
Moore Machinery Company, 3876 Santa Fe Avenue.

MINNEAPOLIS 1, MINNESOTA
The John C. Eide Co., 200 Washington Ave., North.

NEW ORLEANS 6, LOUISIANA. Dixie Mill Supply Co., Inc., Tchoupitoulas & St. Joseph Sts.

OMAHA 2, NEBRASKA
Fuchs Machinery & Supply Co., Jackson at 15th St.

ORLANDO, FLORIDA
Harry P. Leu, Inc., 100 W. Livingston Ave.

PHILADELPHIA 4, PA. Machinery Associates, Inc. 325 E. Lancaster Ave., Wynnewood, Pa.

PORTLAND, OREGON. Hallidie Machinery & Equipment Co., 525 N. Tenth Street.

ROCHESTER 4, NEW YORK
G. W. Brunton & Son, Inc., 703 Temple Bldg.

ST. LOUIS 6, MISSOURI. Colcord-Wright Machinery & Supply Co., 1223-1229 North Broadway.

SALT LAKE CITY 4, UTAH
The Galigher Company, 545 West Eighth South St.

SAN FRANCISCO 7, CALIFORNIA
Moore Machinery Company, 700 Minnesota Street.

SAN JOSE 13, CALIFORNIA
Moore Machinery Co., Porter Building.

SEATTLE 8, WASHINGTON
Hallidie Machinery Co., Inc., 210 Hudson St., South.

SHREVEPORT 93, LOUISIANA. Dixie Mill Supply Company of Shreveport, 200 Edwards Street.

SYRACUSE 2, NEW YORK. The H. A. Smith Machinery Co., 705 Syracuse-Kemper Bldg.

TULSA 3, OKLAHOMA
Gorton-Howell Machinery Co., 215-217 East First St.

WASHINGTON 6, D. C. Shirley, Olcott & Nichols, 726 Mills Building, 17th and Pennsylvania Avenue.

WEST HARTFORD 7, CONNECTICUT
O. C. Stevens Machinery Co., Inc., 76 LaSalle Road.



How Norton brings you the "TOUCH OF GOLD" that adds more value to every grinding job

Grinding, the most universal, most basic of all production processes, is the true "Touch of Gold" that increases the usefulness — and the value — of every manufactured article. That's what happens every time Norton grinding wheels touch the grinding jobs *you* do.

Here are the facts on how Norton leads the field in producing and improving the "Touch of Gold" for you and for all industry.

FIRST IN SIZE

At "Norton City" you'll find over a mile of buildings and thousands of skilled workers, constituting the greatest single supply source of abrasives and abrasive products — world headquarters for your "Touch of Gold". Here also is the world's newest, most modern grinding machine plant, and the famous Norton School of Grinding.

FIRST IN RESEARCH

At Norton over 100 trained technicians, in 19 specialized laboratories, are constantly engaged in product improvement and application. This includes not only the development of new abrasives, bonds and processing techniques, but cooperation with customers in the solution of everyday grinding problems. For the "Touch of Gold" that will solve your own grinding difficulties, look to the organization that leads all others in abrasive development. Look to Norton!



Make sure your grinding gets the top value-adding "TOUCH OF GOLD" — with Norton abrasive products

From Norton laboratories come "TOUCH OF GOLD" exclusives like these

Norton New-Process Wheels are unequalled for uniform structure, identical performance and long, even wear.

32 ALUNDUM* Abrasive, another Norton "first", is one of the most revolutionary developments in abrasive history.

NORBIDE* Abrasive, hardest man-made material, replaces costly diamond dust in many polishing and lapping jobs.

FIRST IN PRODUCT-RANGE

Norton offers you the most complete line of abrasive products, all manufactured to strictest quality control standards. Norton ALUNDUM* abrasives and CRYSTOLON* abrasives, together with Norton-developed bonds, make available hundreds of thousands of grinding combinations.

FIRST IN SERVICE

1. Your Norton Abrasive Engineer is skilled in every detail of grinding wheel manufacture and application. He's ready to go into your plant, study your grinding problems and help you find the money-saving answers.

2. Norton Warehouses are located in key industrial centers. Each contains huge stocks, highly trained personnel and special wheel alteration equipment. And they are backed by the huge stocks at Worcester — further assurance that you'll get Norton wheels whenever you need them, wherever you're located.

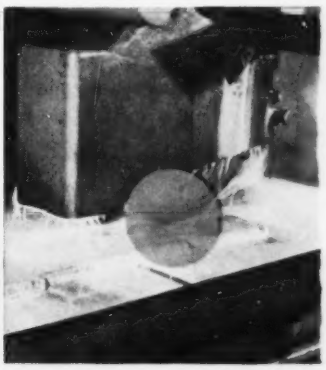
3. Your Norton Distributor, with plenty of practical experience, can give you valuable help in selecting the right Norton wheels. Your distributor is careful to maintain always adequate stocks, selected to meet the particular needs of your area. He is your direct connecting link with the entire Norton organization — world headquarters for the "Touch of Gold" that means more profitable grinding for *you*. NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

NORTON
ABRASIVES
Making better products to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries



ROUGH GRINDING



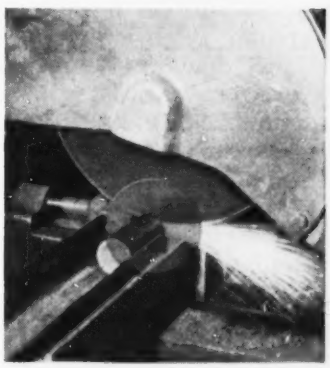
SURFACE GRINDING



O. D. GRINDING



INTERNAL GRINDING



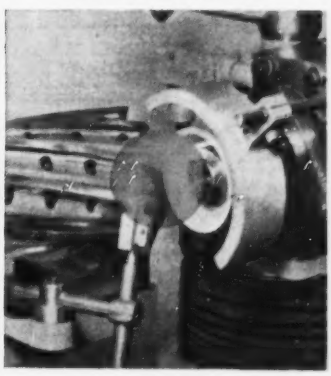
CUTTING-OFF



DIE AND MOLD GRINDING



BARREL TUMBLING



TOOL AND CUTTER GRINDING

NO GETTING AROUND IT!



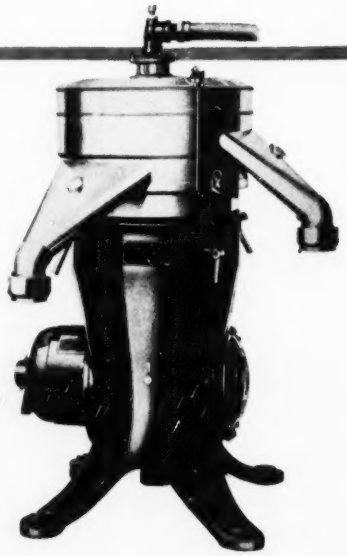
In All These 18 Applications De Laval Purification Pays Off!

Almost every metalworking plant has one or more operations where an adequate supply of clean, dry oil is a virtual necessity. 18 such applications are suggested in the panel and in every case a De Laval Oil Purifier provides the quickest, low-cost method of keeping these oils ***clean*** and ***dry***.

Clean oil is the prime requisite in most cases. Because of the greater intensity of centrifugal force, De Laval machines are more thorough than any other means. They remove every bit of dirt, abrasive or metallic particles. Thus, cutting oil can be used safely over and over again, with increased tool life and possibly less dermatitis among the men. Dies last longer when drawing oil is centrifuged; tests are more reliable when testing oil is purified.

Dryness can be a most vital consideration, as in the case of slushing compound purification. Here, too, De Lavals do the best work, quickest and most thoroughly. Water removed from the oil is continuously discharged—cannot possibly lead to recontamination.

MOTOR BLOCK TEST OIL
BALER OIL • BORING OIL
BRIQUETTING OIL • CABLE OIL
CUTTING OIL • DRAWING OIL
GRINDING COOLANT
ENGINE OIL • HONING OIL
HYDRAULIC OIL • RECOIL OIL
LUBRICATING OIL
SHOCK ABSORBER OIL
QUENCHING OIL
SLUSHING OIL
TRANSMISSION OIL
WASHING OIL



DE LAVAL

PURIFIERS AND CLARIFIERS FOR FACTORY OILS

THE DE LAVAL SEPARATOR COMPANY
Chicago POUGHKEEPSIE, N.Y. San Francisco

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Multiple spindle automatic builders do not deny the importance of good frame design. As early as 1920 Cone's revolutionary frame was substantial evidence that Cone did something about it.

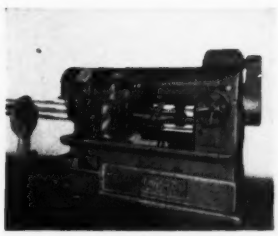
For some time there has been discussion concerning the relative merits of the use of 100% carbide tooling on multiple spindle bar automatics. There has been very little information made available about successful carbide application to this type of machine by its builders or by carbide suppliers. But Cone is doing something about it.

The Conomatic Carbide Development program is accumulating much helpful information for "automatic" users through test runs under production conditions. The illustration is an example of such information applied to an actual production run. Full data is available.

Action speaks better

MATERIAL—ALUMINUM: Hole drilled with 1" and 1 1/16" dia. drills to 1½" depth, and tapped to ¼" depth.

	HSS	CARBIDE
Cycle Time	90 secs.	11 secs.
Work Spindle Speed	270 R.P.M. at 104 S.F.	830 R.P.M. at 320 S.F.
Tool Wear	5,000 pcs. per grind	20,000 pcs. per grind



Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

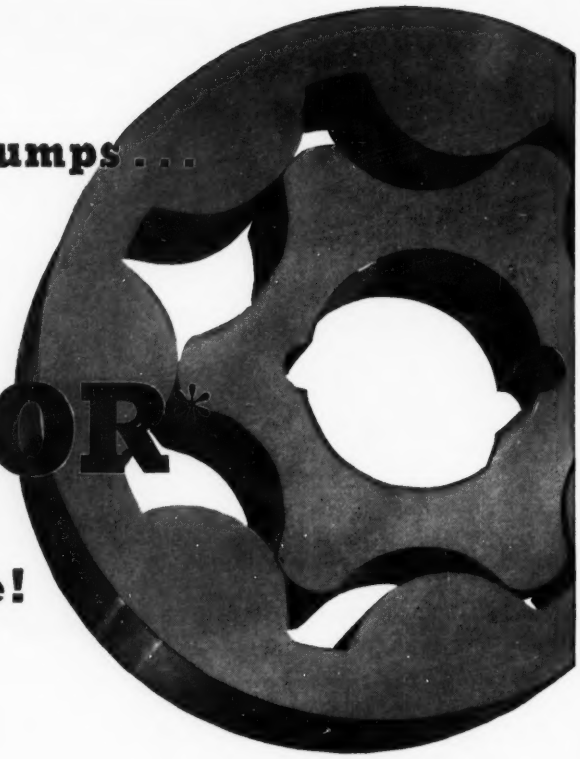
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In Gerotor hydraulic pumps . . .

and motors . . .

the GEROTOR*

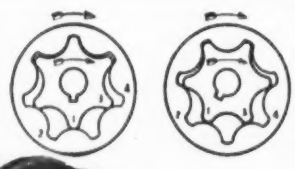
makes the difference!



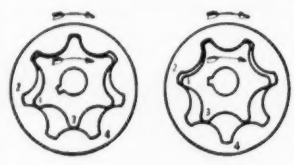
The patented Gerotor principle is represented by a pair of gear-shaped elements, one within the other. In pumps, power is applied through the shaft to the inner Gerotor and is transmitted in the closed mesh region to the outer Gerotor; in motors, the same principle operates in reverse.

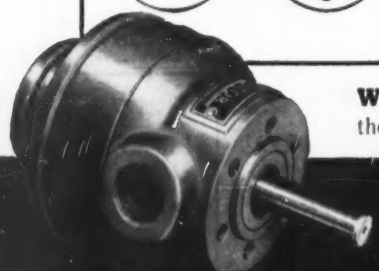
Each tooth of the inner Gerotor is in sliding contact with the outer Gerotor at all times, providing continuous fluid-tight engagement at very low contact speed. The contact points revolve only once in seven to nine revolutions, depending on the type of unit. This reduced friction permits higher shaft speeds, assures longer life. Opening and closing of chambers between the teeth is gradual across long ports, eliminating sudden shock and excessive turbulence, and reducing pressure variations found in conventional gear pumps. In Gerotor hydraulic pumps and motors, the Gerotor principle produces high volumetric and mechanical efficiency.

**Gerotor is not just a name . . . it's the heart of the finest hydraulic pumps and motors made.*



The two Gerotors revolve at different speeds, resulting in a continuous opening and closing of spaces as shown in this diagram. Follow the changing position of tooth #1 as rotation takes place. Note its relation to space #2. As rotation continues, tooth #1 gradually displaces oil from space #2, thus creating pressure.





Whatever your need in hydraulic pumps or motors, consult the Gerotor May engineers. *Write for free literature.*

GEROTOR MAY CORP.
BOX 86
BALTIMORE 3, MD.

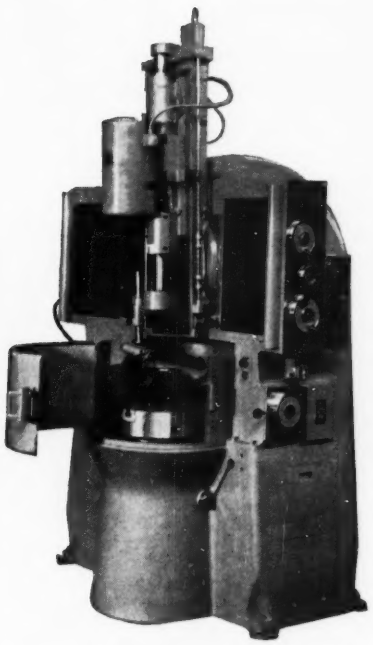
GEROTOR
HYDRAULIC PUMPS & MOTORS

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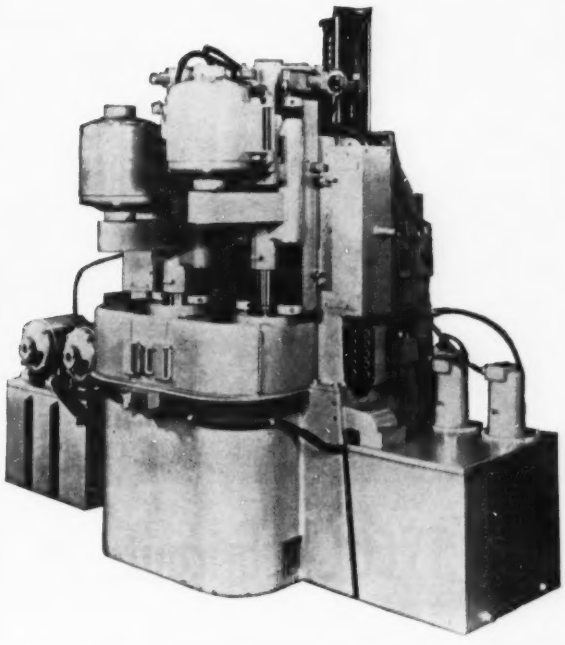
SPRINGFIELD

GRINDERS

the modern approach to chucking grinder operations



Vertical grinding of O.D., I.D., faces, tapers, shoulders, steps or combinations with one set-up. Holds extremely close tolerances on precision production. All slideways above grinding wheel. No gravitational pull; work sets solidly on vertical spindle. Greater work visibility; easier loading; more convenient control.



Dual spindle Vertical Grinder has individual operated spindles with individual controls and individual automatic cycles. Can be arranged for duplicate production or to handle consecutive operations on a single piece part. Higher production with less floor space and lower capital investment.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES



...with TYCOL lubricants on hand!

A Cutting Oil with a "Delicate" Touch! Screw threading to fine tolerances is the acid test of any cutting oil . . . one reason why we ask: can your present oil measure up to Tycol Angrove 40? Take the customer who was threading 3/8" standard threads on 303 Stainless . . . with thread extending to the head . . . and the overall job calling for an extremely fine finish. The best of the competitive oils used yielded only 600 pieces before serration and burring appeared, necessitating regrinding the chaser. Tycol Angrove 40 produced some 4,500 pieces with no defects apparent under magnification . . . and with no regrinding of the chaser throughout the entire run! If you can't top this – contact your local Tide Water Associated office for further information!

Over 300 Tycol industrial lubricants are at your disposal . . . engineered to fit the job!

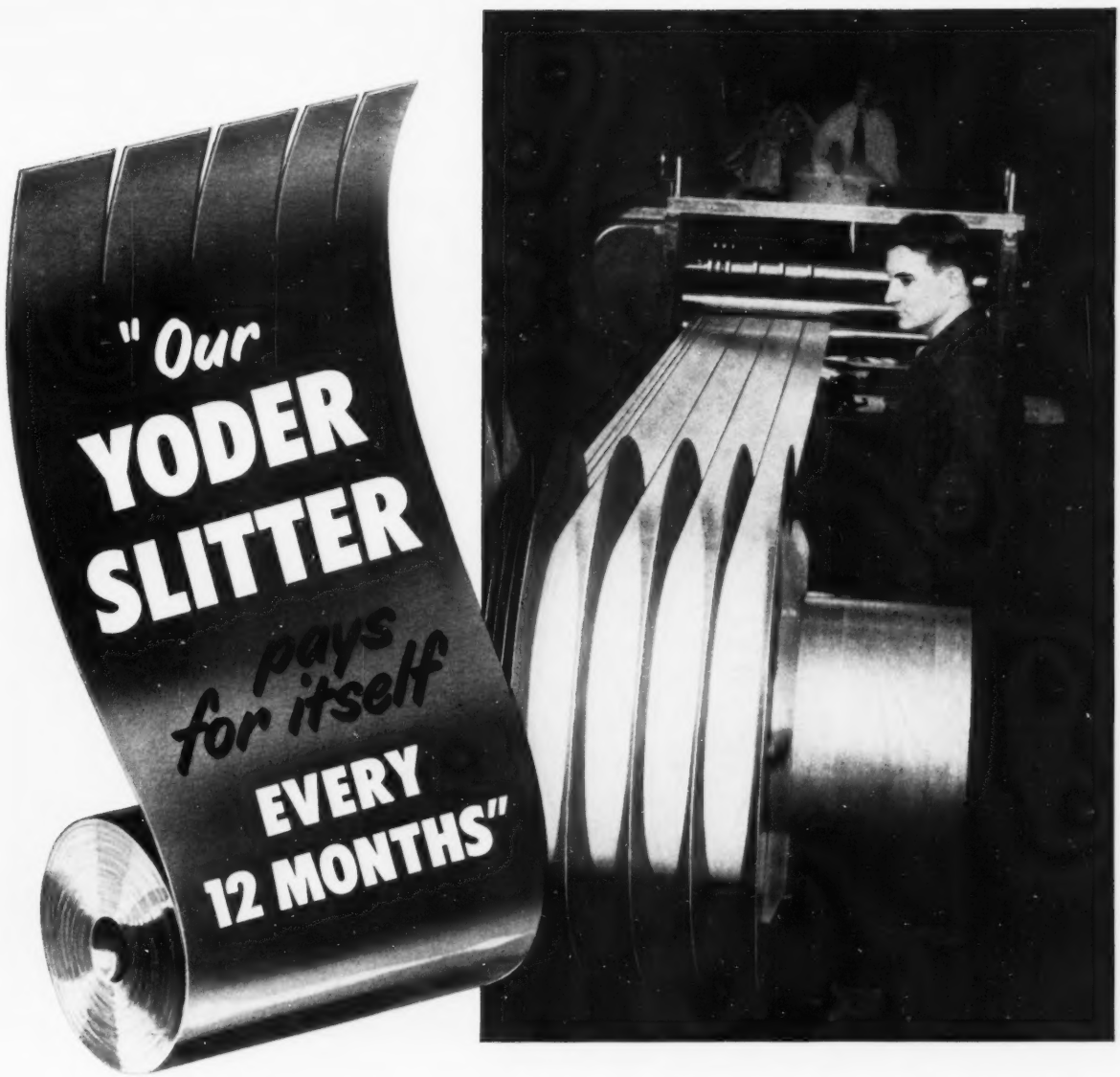
TYCOL
INDUSTRIAL LUBRICANTS

Boston • Charlotte, N. C. • Pittsburgh
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Tulsa • Cleveland • San Francisco
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TIDE WATER ASSOCIATED OIL COMPANY
17 BATTERY PLACE · NEW YORK 4, N.Y.

REFINERS AND MARKETERS OF VEEDOL . . . THE WORLD'S MOST FAMOUS MOTOR OIL

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or oftener" is a comment made by many users of slit-to-width coiled strip. The direct saving ranges from $10.00 to $30.00 or more per ton, depending on width and gauge of strands slit.

Of far greater importance to most Yoder Slitter owners is the fact that they can now buy standard widths competitively, from a large number of sources, thereby obtaining quicker deliveries and better prices. Formerly they were limited to a few sources able to supply slit-to-width strands, often resulting in production bottlenecks while waiting for delivery.

These and other pertinent subjects, including cost analysis and time studies, are discussed in the Yoder Slitter Book, a practical treatise on the mechanics as well as the economics of slitter operation. Ask for it.

THE YODER COMPANY
5504 Walworth Ave. • Cleveland 2, Ohio

Complete Production Lines

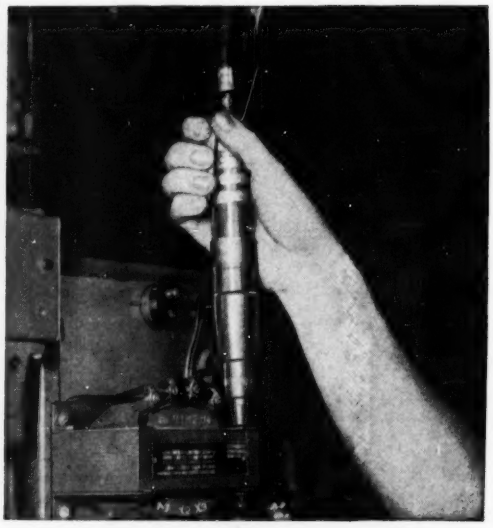
- ★ **COLD-ROLL-FORMING and auxiliary machinery**
- ★ **GANG SLITTING LINES for Coils and Sheets**
- ★ **PIPE and TUBE MILLS–cold forming and welding**

ENGINEERING YODER MANUFACTURING



Quick cure

for a production line headache



—A NEW AIR SCREWDRIVER THAT'S REALLY QUIET

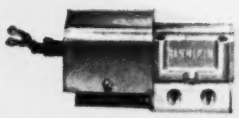
Replace your present screwdrivers with Chicago Pneumatic's new CP-3008 – the really quiet, air screwdriver. Its supersonic exhaust feature changes sound waves to a frequency which approaches the limit of human hearing.

The rugged, all-steel CP-3008 weighs only 1 lb., 14 oz. . . . has a side outlet exhaust deflector that rotates and locks in any position for directional exhaust. Built-in speed control assures precision speed increases and decreases. Also has a simple, adjustable clutch. Available with many accessories, the CP-3008 has a rated range of #4, #6 and #8 screws but in some cases can be used on #2's and #10's. Write for Bulletin SP-3096. *Chicago Pneumatic Tool Co., 8 East 44th Street, New York 17, N. Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

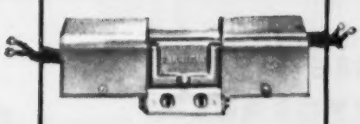
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CC1-25, Solenoid-Operated Spring Return



CC6-25, Foot Operated



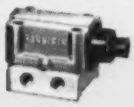
CC11-25, Solenoid-Operated Momentary Contact Type



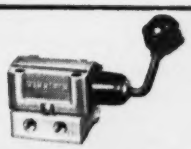
CC7-25, Foot-Operated Locking



CC2-25, Ball Cam-Operated



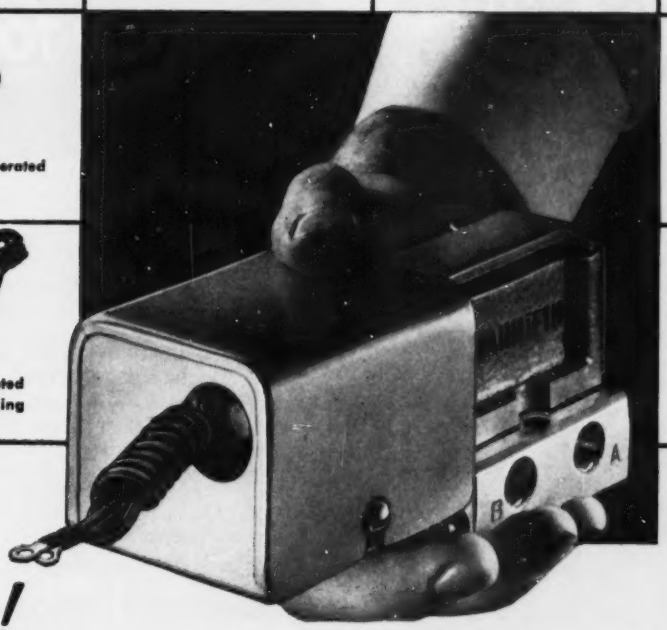
CC10-25, Piston-Operated Spring Return



CC4-25, Hand-Operated
CC5-25, (Same), Locking



CC12-25, Piston-Operated Momentary Contact Type



Now!

¼" P-M 4-Way Valves!

more compact, less expensive than any similar valves

Here's a new series of direct-operated 4-Way Valves for the control of small, double-acting air cylinders. It's the latest addition to Hannifin's revolutionary "P-M" line.

Designed for easier maintenance. The only moving part is the valve stem with its two poppets. The valve body, which contains this stem, is quickly removed from the separate "manifold" to which all pipe connections are made. Thus, the entire valve can be serviced without breaking line connections.

The CC Series. These new "P-M" 4-Way Valves, nominally of ¼" pipe size, flow so much air that they can be used competitively with other ⅜" valves when ordered with ⅜" ports. They are corrosion resistant throughout and meet J.I.C. recommendations.

Compare! You'll find these new Hannifin 4-Way Valves more compact, simpler and easier to use, and *less expensive* than any comparable valves.

GET THE COMPLETE HANNIFIN "P-M" AIR CONTROL VALVE CATALOG

The new Hannifin Controls Catalog contains complete information and specifications on all Hannifin "P-M" Valves, including this new 4-Way direct-operated series. Write for Bulletin 232.



HANNIFIN

Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Ill.

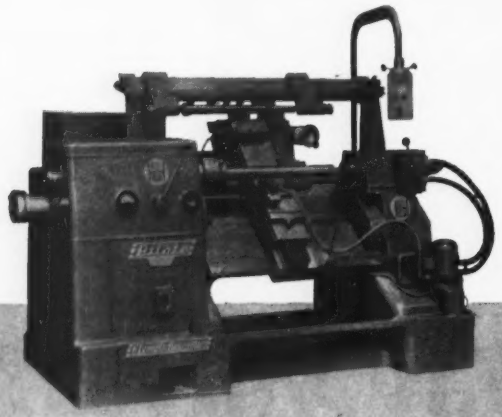
Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

HIGH SPEED HYDRAULIC Copying Lathes *for every purpose!*

THE TURNING METHOD OF THE FUTURE TODAY!

The greatest advance in turning methods since the development of carbide tools! Whether your production is on a large scale or you need short, economical runs, there is an H.E.B. Copying Lathe to fit the special needs of your operation.

Why use a dozen tools when the H.E.B. *with just a few* does the job faster, better and at less cost! Incorporating the patented H.E.B. tracer device these versatile machines give you maximum output at high speed with remarkable accuracy and finish.

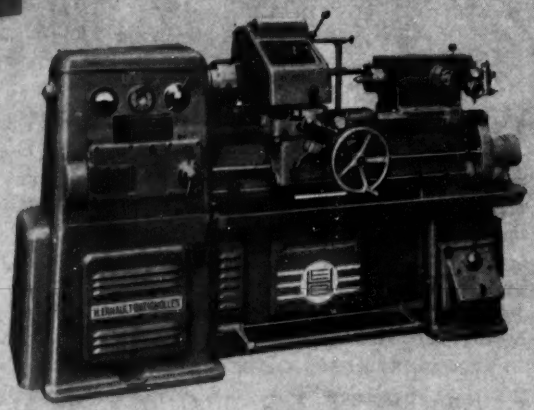


H.E.B. PILOTE COMPLETELY AUTOMATIC HYDRAULIC COPYING LATHE

The first *completely automatic* hydraulic copying lathe. The operator has only to load the machine and *press a button* to start the cycle. When the part is finished the tool returns to its starting position and the spindle stops automatically! Savings in setup time and tooling costs are enormous. Motors to 60 H.P.

COMPLETELY AUTOMATIC

SEMI-AUTOMATIC



H.E.B. HIGH SPEED HYDRAULIC COPYING LATHE

This absolutely rigid, chatter-free machine with built-in tracer device eliminates costly down time, takes no more than 10 to 20 minutes for setting up and the finished parts are copy turned up to 300% faster than on multi-tool lathes.

The OP Model, with its 20 H.P. motor, takes heavy cuts with carbide tools at spindle speeds 50 to 3600 RPM. GT Models with rotating pattern are designed to copy an infinite variety of non-circular work.

These machines are designed and built in France by H. Ernault Batignolles, machine tool manufacturers for almost a hundred years. If you want more information about tomorrow's turning methods, then write, wire or telephone *now* for a demonstration or catalog. See our insert in Sweet's Machine Tool Catalog.

"THE WAY TO TURN"

H·E·B

H. E. B. MACHINE TOOLS, INC.

475 FIFTH AVENUE • NEW YORK 17, N. Y.

TELEPHONE: LEXINGTON 2-0266

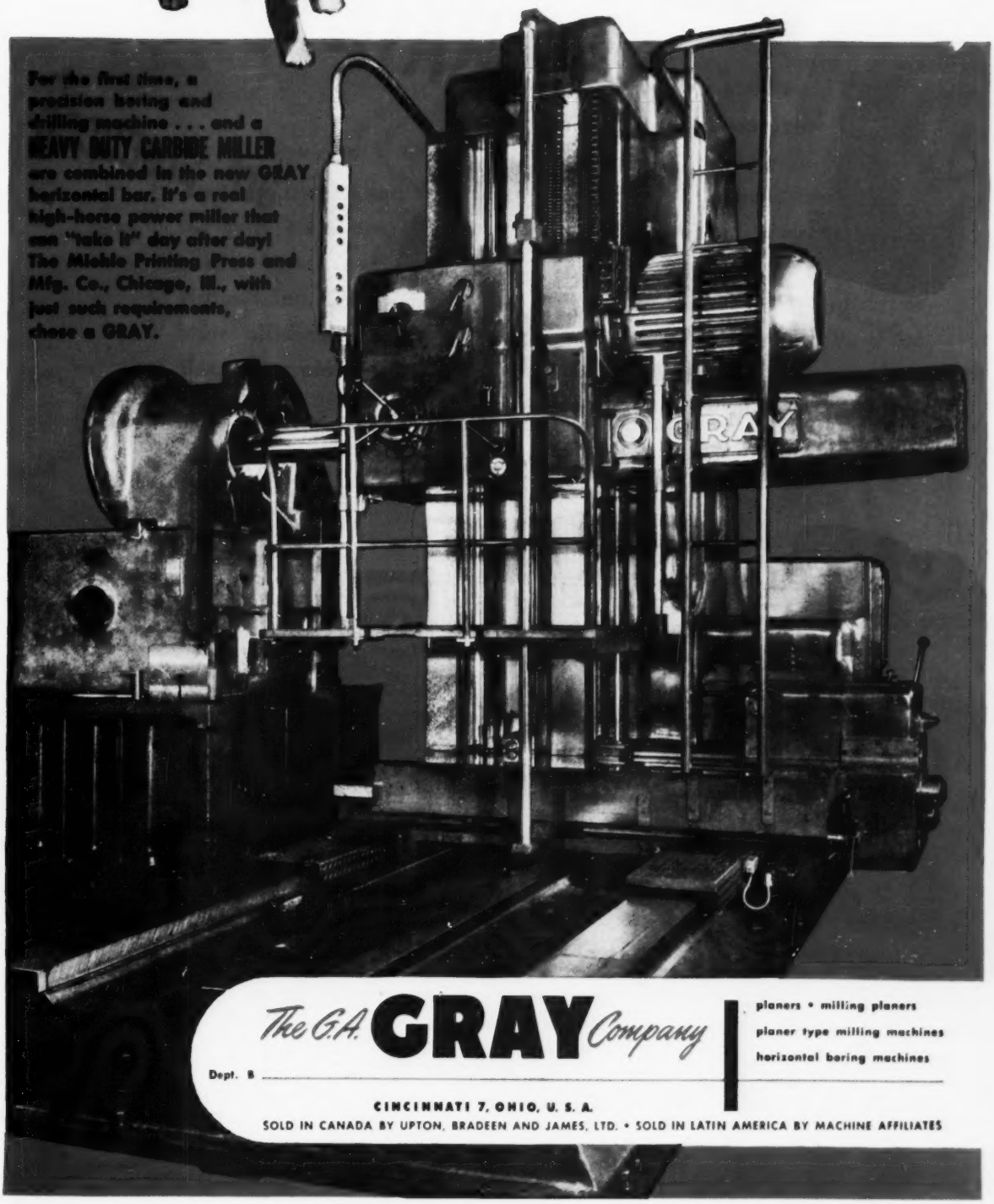
Certain exclusive sales territories are still open.

COPYING LATHES • ENGINE LATHES WITH COPYING ATTACHMENTS • CARBIDE TOOL GRINDERS • RADIAL DRILLS

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YOU....DON'T "PUSSY FOOT" WITH A GRAY





For the first time, a precision boring and drilling machine . . . and a **HEAVY DUTY CARBIDE MILLER** are combined in the new GRAY horizontal bar. It's a real high-horse power miller that can "take it" day after day! The Miehle Printing Press and Mfg. Co., Chicago, Ill., with just such requirements, chose a GRAY.

The G.A. **GRAY** *Company*

Dept. B

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

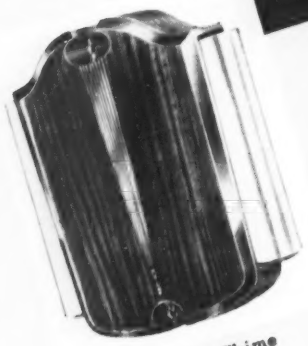
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES



Ventilating Fan

ACCURATE BLANKS

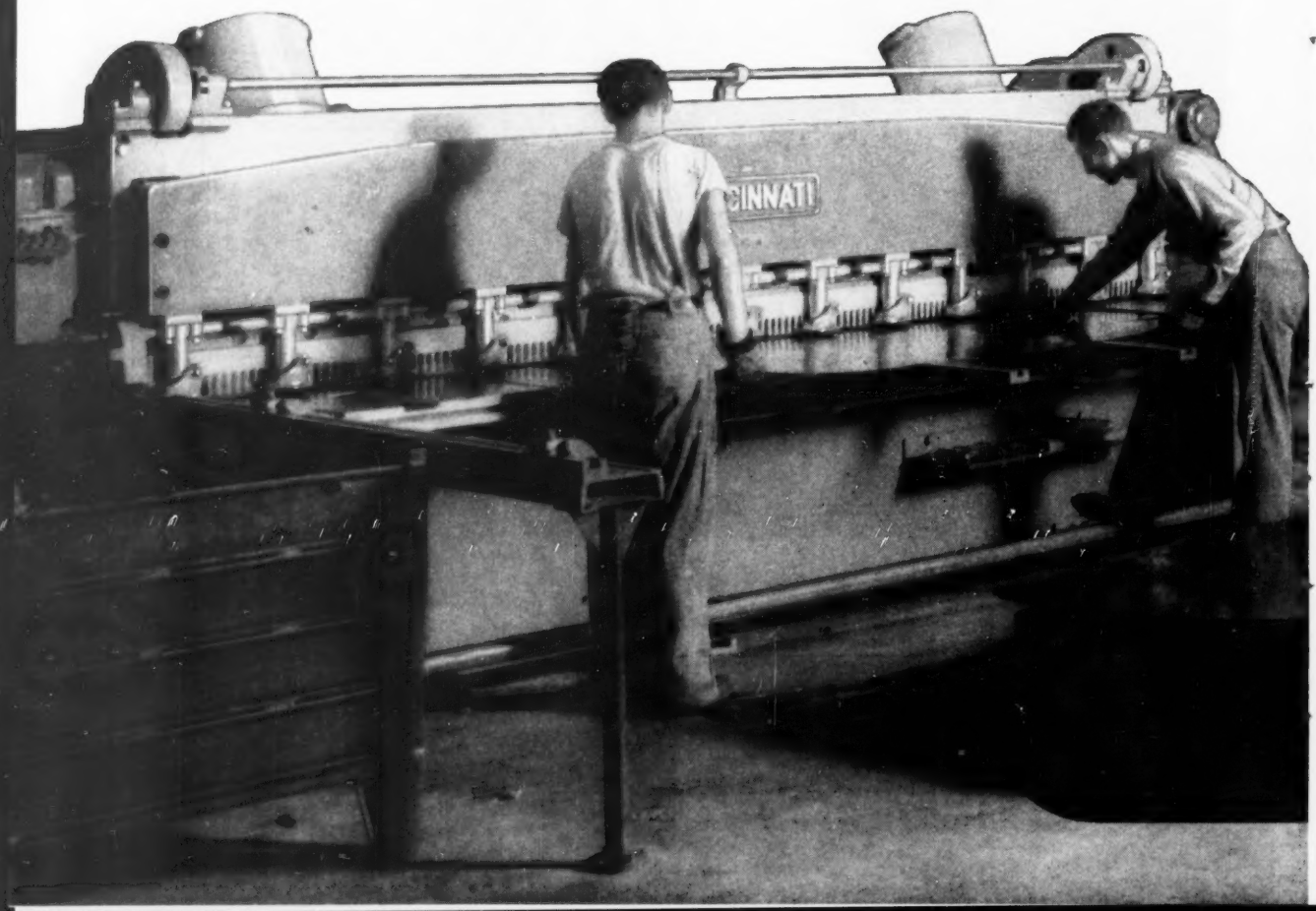
are produced



Colonial Chime



Electric Ceiling Heater

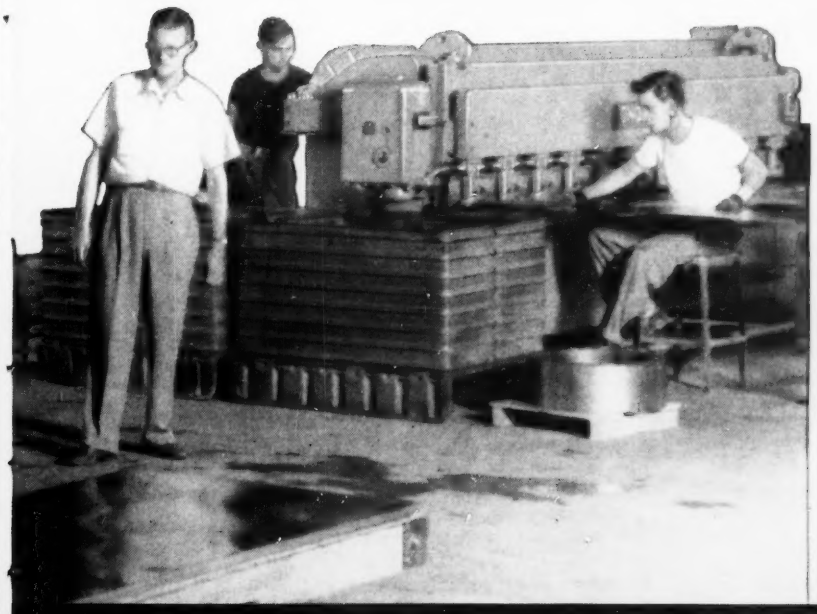


for all these products on Cincinnati Shears

Accurate blanks and strip stock of many sizes are sheared on these Cincinnati Shears at Nutone, Inc. The shearing operation eliminates costly dies, is flexible, rapid and economical.

One hundred and seventy-five tons of light sheets are sheared a month. Press operations are speeded and spoilage is at a minimum. The flexibility of the shearing operations take care of new products or changes in design with no tooling or special costs. Investigate these accurate Shears.

Write for catalog S-6.



Photos courtesy
Nutone, Incorporated,
Madison and Red Bank Roads,
Cincinnati 27, Ohio

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO, U.S.A. SHAPERS • SHEARS • BRAKES

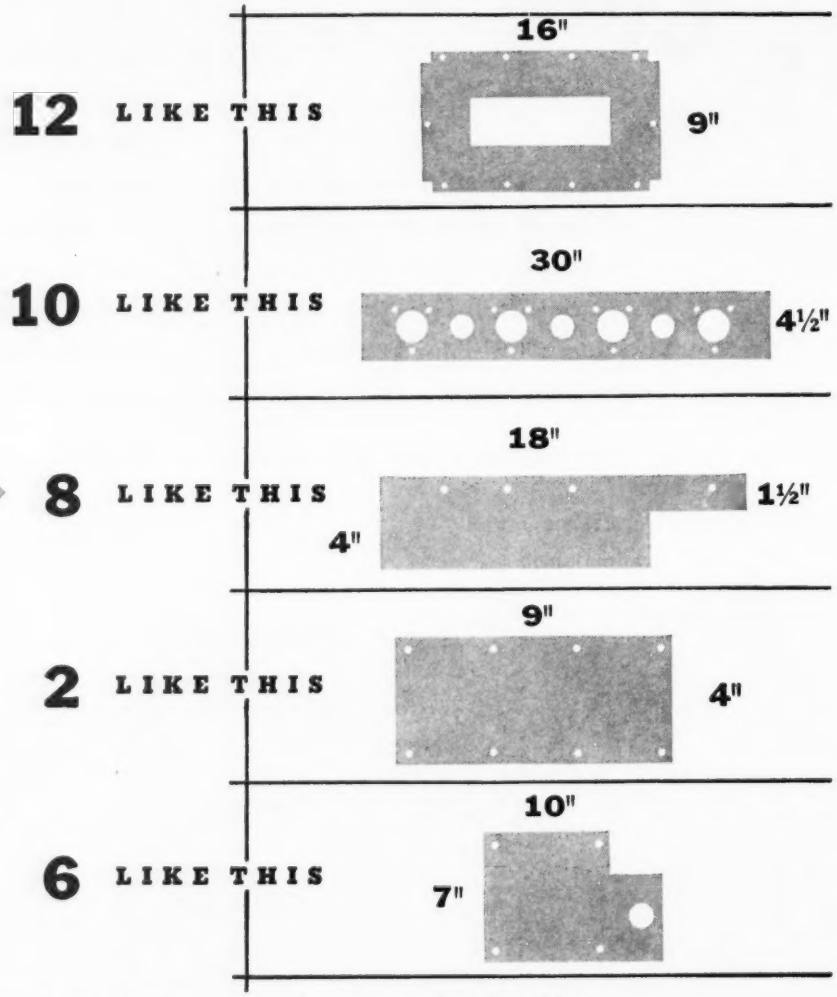
CINCINNATI

with a WIEDEMANN you can

Reduce INVENTORY & STORAGE SPACE!

produce parts as required.

All **38** **PIECES** *were pierced in* ⅛" *mild steel* **IN** **28** **MINUTES** *(including all set-up)*



The company producing the above parts has eliminated inventory of these and many other items; has greatly reduced inventory of punches and dies—and they no longer need to stock templates.

The Wiedemann method enables them to ship parts directly to assembly rather than the stockroom.

Items are produced weekly or more often if necessary. Sizes of parts pierced on the Wiedemann range from 5 ft. by 10 ft. down to 2" squares.

Inventory and storage reduction are just two of many cost-reducing features of Wiedemann Turret Punch Presses. We'll gladly make a time study on your own work.

WIEDEMANN MACHINE COMPANY

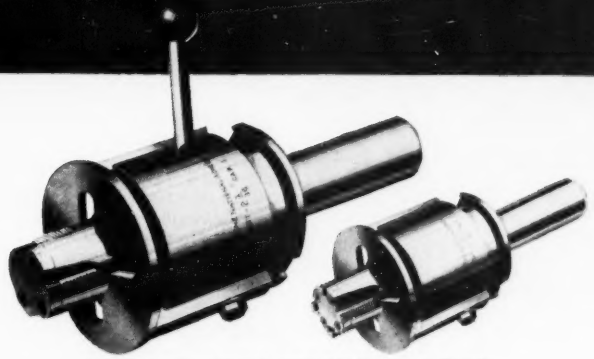
4205 Wissahickon Avenue, Philadelphia 32, Pa.

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don't take chances when TAPPING

★ either in the quality of thread you need...

or on the time you expect to save

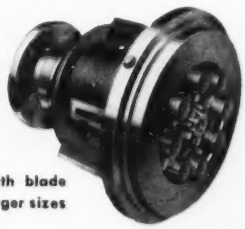


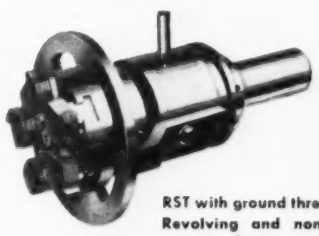
RST with ground thread radial blade chasers. Revolving and non-revolving. Range 1-1/4 to 4" in 8 sizes.



RSA Solid Adjustable Tap with ground thread radial blade chasers. Range 1-1/4 to 4" in 8 sizes.

RES-L Positive Receding Action Tap with differentially spaced ground thread circular chasers for 4-1/2 to 13-3/8" taper couplings. Two bodies and one additional nose piece cut entire range. Or with blade chasers, range 2-3/4 to 4". Larger sizes on application.





RST with ground thread circular chasers. Revolving and non-revolving. Range 3 to 5-1/2" with one body assembly and 3 core pieces.

Unless both have been engineered and proved out at the tool source, freed from experimental hazards such as down-time and scrap loss *in your shop*—your internal threading costs will still be a gamble.

NAMCO BASIC ADVANTAGES IN DESIGN – Relatively few parts, core piece rigidly supporting chasers. Instantaneous positive collapsing action so important on blind hole tapping. Parts hardened for wear, not just toughened, and completely precision ground for accuracy. Adjustment to fine diametric limits made by one screw and rigidly held. Chasers quickly removable for regrinding.

ADAPTABILITY WITH MINIMUM TOOLS. Each size RST non-revolving Tap is quickly changed for revolving spindle machines simply by removing reset handle in hood—using same chasers. Also interchangeable chasers between collapsible and solid adjustable types.

GROUND THREAD CHASERS—are standard for all types and sizes—radial blade chasers 1¼ to 4" range and the famous circular ground thread chasers for sizes 3 to 5". For the Oil Industry the RES-L perfected receding action with differentially spaced circular chasers has no equal.

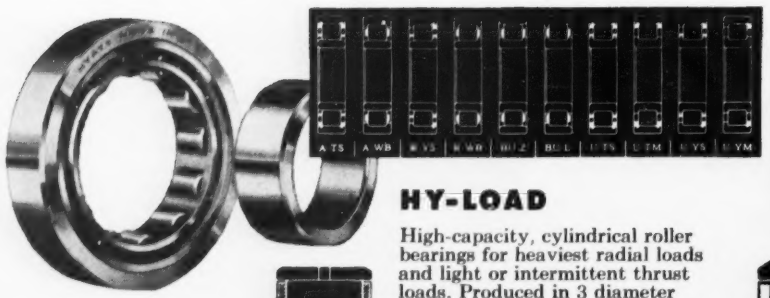
Whether for class 3 threads in fine instrument work or dry seal couplings or medium tolerance jobs or commercial straight or taper threads—ask us to show you how these Namco precision taps with ground thread chasers can take the experimental headaches out of your tapping, give you smoother threads—and save you plenty.

Ask for specifications DT-52 or send sample

The NATIONAL ACME COMPANY

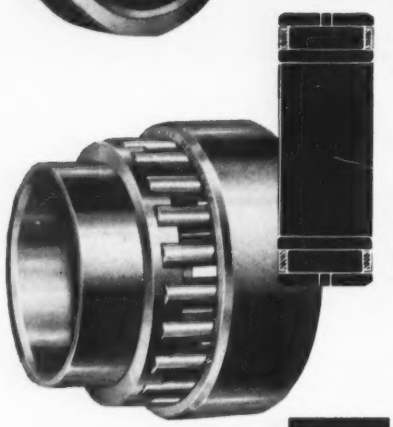
170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics, 1-4-6 and 8 Spindle—Hydraulic Thread Rolling Machines—Automatic Threading Dies and Taps—Limit, Motor Starter and Control Station Switches—Solenoids—Contract Manufacturing.



HY-LOAD

High-capacity, cylindrical roller bearings for heaviest radial loads and light or intermittent thrust loads. Produced in 3 diameter series, 2 widths and more than 800 sizes.



INDUSTRIAL INCH

Designed for slow-moving, heavily loaded machinery where large-diameter shafts are the rule. Accordingly, it is available in fractional-size bores for shafts from 4" in diameter upwards.

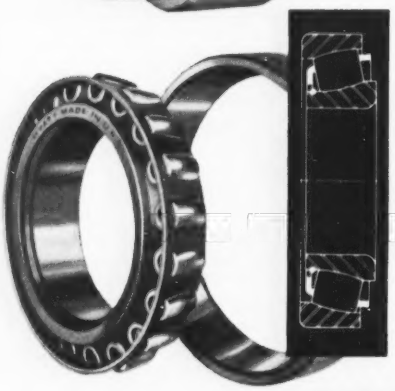


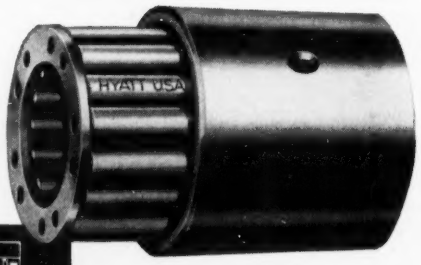
WOUND ROLLER

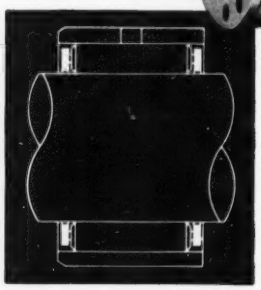
This is a three-part separable bearing available in various width classifications. The roller construction provides maximum resistance to shock, abrasion and fatigue.

BARREL

A series of angular-contact, self-aligning bearings capable of sustaining both radial and thrust loads. Race and roller curvatures insure ideal distribution of load, not only for normal operation but also for conditions of misalignment.







TRUNNIONED ROLLER

Ideal for industrial trucks, textile machinery, gear pumps, conveyors, hoists and agricultural equipment. Rollers have trunnioned ends which fit into holes in the end rings. End rings are located and held parallel by spacing bars which also guide and retain rollers.

DESIGNED FOR HEAVY DUTY...

HYATT ROLLER BEARINGS

...and there's a type and size for every need

Hyatt's complete line of radial and angular-contact bearings—*more than 800 sizes in the Hy-Load series alone*—makes the engineers' job easier, because it makes possible greater design flexibility. For the equipment *buyer*, this means longer bearing life and lower maintenance costs—with just the right bearings designed into every vital load-carrying position.

The next time you buy new equipment, or make a changeover, *specify lower maintenance costs by specifying Hyatt Bearings!* And if you need technical help in your selection of bearings, or desire information about particular bearings or their applications, ask for the services of a Hyatt sales-engineer. Call or write Hyatt Bearings Division, General Motors Corp., Harrison, N. J.

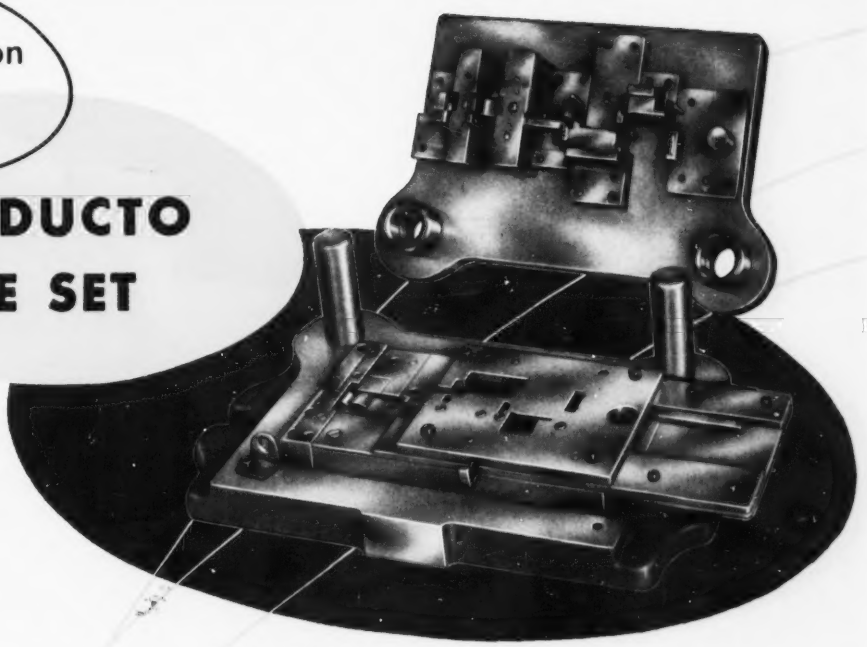
HYATT BEARINGS DIVISION • GENERAL MOTORS CORPORATION

For more information on products advertised, use Inquiry Card, page 247

teamed precision of die and

PRODUCTO DIE SET

makes this intricate job possible





THE fuse terminal, shown below, is produced by the Federal Electric Products Co. for use in their Noarc front operated safety switch. A Producto Die Set was selected to maintain the precise production of a top quality die at high speed operation.

Material is half hard 3/32″ copper (Rockwell 30-40 B scale), automatically fed to a Niagara 40 ton press. The progressive die stations are: 1) pierce and stamp, 2) notch, 3) lance and emboss, 4) form 5) finish form. Die is held to extremely close tolerances. Production: 4000 pieces (1-3/16″ x 2-1/8″) per hour, 70,000 between grinds.

Today's production calls more than ever for quality control . . . which, in die work, necessitates the best in die sets. Call for Producto . . . and be sure!



the **PRODUCTO MACHINE COMPANY**
985 HOUSATONIC AVENUE
BRIDGEPORT 1, CONNECTICUT

BAY STATE



for BETTER Surface Grinding Use QUALITY Segments

Facts about BAY STATE segments . . .

1. COMPLETE RANGE. All standard shapes and sizes, plus many special ones, in both resinoid and vitrified bonds.

2. RAPID SERVICE. Excellent delivery schedules from large stocks and completely modern manufacturing methods.

3. HIGHEST QUALITY. Consistently uniform cool-cutting structure and exact specification are built in by BAY STATE under the most rigid standards of quality control.

4. PRICE ADVANTAGE. BAY STATE's special 8A abrasive, at a non-premium price, will work wonders on your tool room surfacing jobs . . . further, there is no extra charge for the BAY STATE bonus of outstanding, consistent performance.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Mass., U. S. A.

Branch Offices and Warehouses:
Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All Principal Cities.
In Canada:
Bay State Abrasive Products Co.
(Canada) Ltd. Brantford, Ont.

Send for latest BAY STATE Surface Grinding brochure.

For more information on products advertised, use Inquiry Card, page 247

See SCHIESS equipment on display at
AMERICAN SCHIESS SERVICE CENTER
38th Street & AVRR • Pittsburgh, Pa.

By combining basic Schiess elements, extra heavy machines that would normally be considered special tools, can be built to your work diameter and load requirements.

The equipment shown here is typical of unusually large boring mills of latest Schiess design which, like the smaller models, incorporate new operating features listed below.



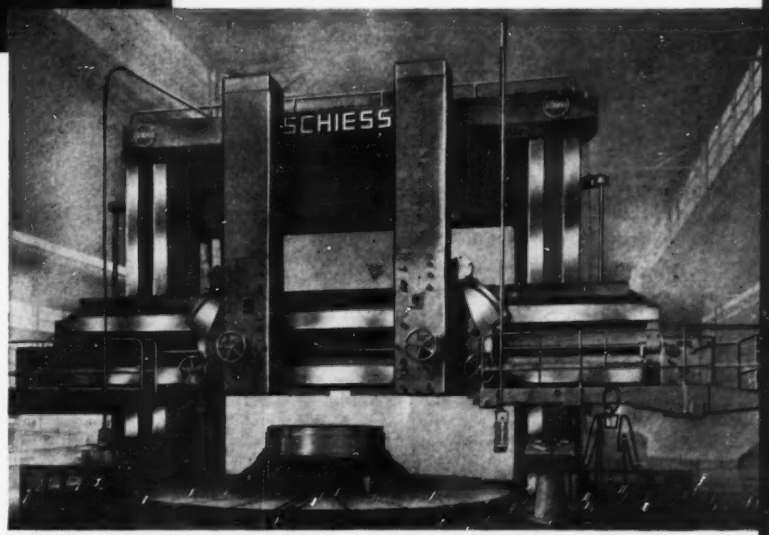
Model 3K Vertical Boring Mill
with 15 ft. turning diameter

NEWLY DESIGNED

HUGE VERTICAL BORING & TURNING MILLS *like these* -

Built from basic Schiess designs to any diameter from 10 ft. to 84 ft.

Model 5K Vertical Boring Mill
with 22 ft. turning diameter



Fingertip Speed Control

Counterbalanced cross rail and side head

Octagon rams which can be swiveled, completely enclosed

Pendant Control

Automatic Lubrication

Vertical Boring Mills of this type can be equipped with inner and outer tables—and with 1 or 2 operator control panels.

Engineering Division

AMERICAN SCHIESS CORPORATION

38th Street and AVRR, Pittsburgh, Pennsylvania

Sole Distributor

KO KURT ORBAN COMPANY, INC.

205 East 42nd St., New York 17 • 1256 East 12th St., Cleveland 14
18627 James Couzens Highway, Detroit 35 • 1939 Santa Fe Ave., Los Angeles

THE JOBS PROVE IT

YOU RETRENCH ON STAMPING COSTS WITH HENRY & WRIGHT DIEING MACHINES

In the small area occupied by a compact Henry & Wright Dieing Machine you have a production tool equal in capacity to five or ten conventional presses. Progressive stamping on a Henry & Wright really pays off, because this press is specifically designed for this type of work.

Angular thrust is not transmitted to the upper crosshead. Low center of gravity holds vibration to an absolute minimum. Long ways, plus four post guidance and a pulling instead of pushing stroke, serve to strait-jacket punch travel. Accurate punching produces high quality work and a lot more of it between die grinds. Much less metal is removed when dies are ground.

Get the whole story about the Henry & Wright Dieing Machine – the economies you achieve in die life, inspection, toting, operators. Retrench by modernizing with Henry & Wright.



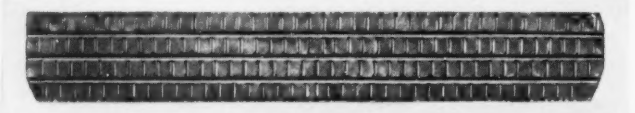
Refrigerator part produced at speed of 65 strokes per minute of .060" cold rolled steel on 100-ton Dieing Machine.



Hemispherical shell 2" deep produced at speed of 60 strokes per minute.



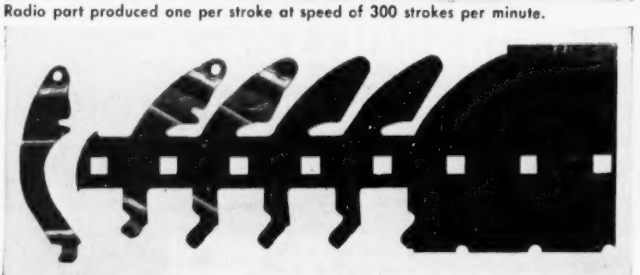
Paired sections of housing produced of .065" hot rolled steel at 60 pairs per minute.



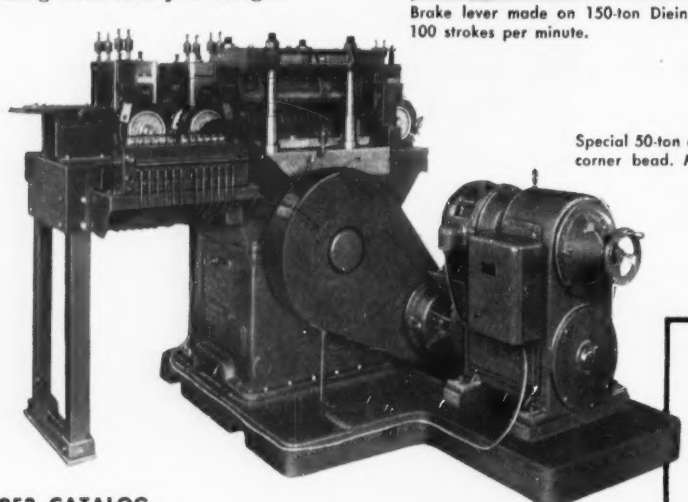
Radiator fin of copper made three at a time at speed of 85 strokes per minute.



Radio part produced one per stroke at speed of 300 strokes per minute.



Brake lever made on 150-ton Dieing Machine operating at speeds in excess of 100 strokes per minute.



Special 50-ton dieing machine for production of expanded corner bead. Machine operates 620 strokes per minute.



1953 CATALOG

Write for your copy on company letterhead to Henry & Wright, Division of Emhart Mfg. Co., 461 Windsor St., Hartford, Conn.

H&W

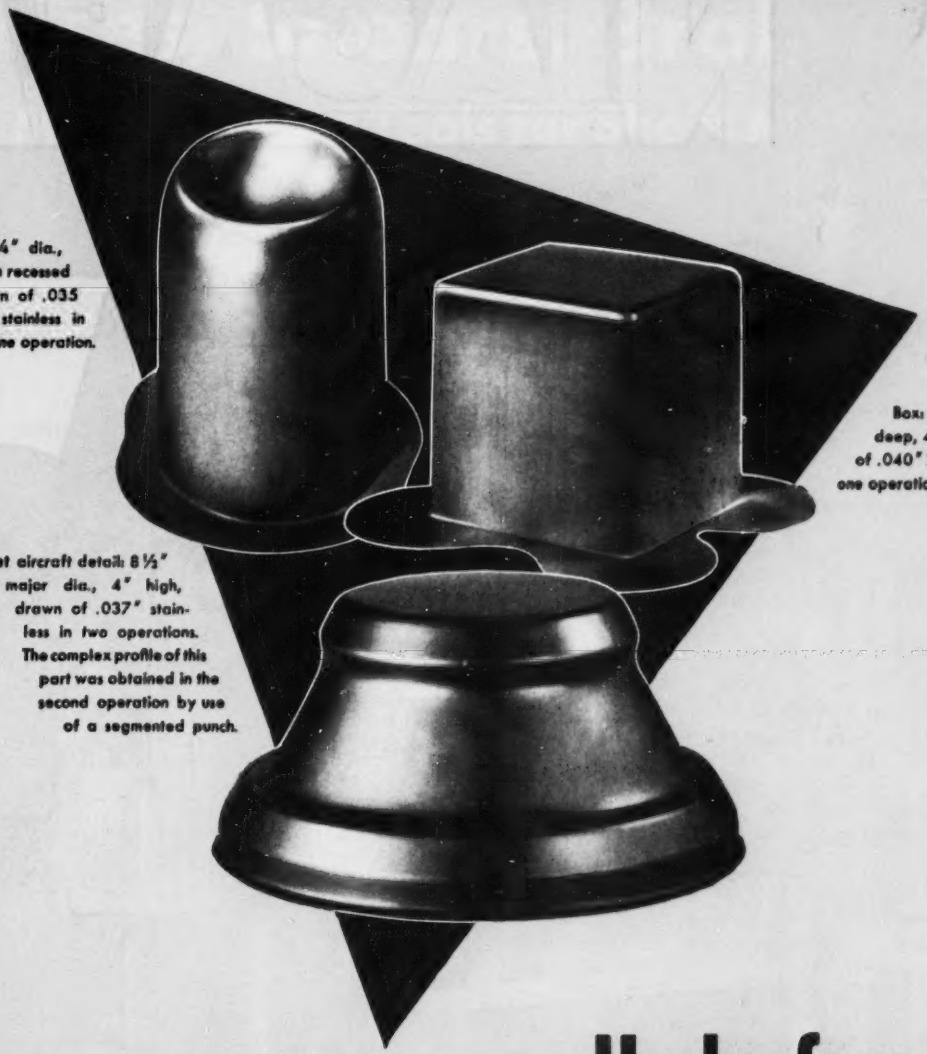
HENRY & WRIGHT

DIVISION OF EMHART MFG. CO.

Only the best is good enough

For more information on products advertised, use Inquiry Card, page 247

DRAW cups, cubes and complex contours...



Cover: 4¼" dia., 5½" high with recessed top, drawn of .035 Type 305 stainless in one operation.

Box: 4½" wide, 4¼" deep, 4½" high, drawn of .040" 2S0 aluminum in one operation.

Jet aircraft detail: 8½" major dia., 4" high, drawn of .037" stainless in two operations. The complex profile of this part was obtained in the second operation by use of a segmented punch.

faster, easier, cheaper by Hydroforming



You will save time and money from blueprint to finished sample. A discussion of Hydroforming with your engineering and manufacturing department executives may prove of inestimable value to your company. Call in a Cincinnati Milling field engineer. Bulletin M-1759-2 gives a description of the Hydroforming process and specifications of the five machine sizes . . . 12", 19", 23", 26" and 32". Write for your copy.

CINCINNATI **Hydroform**

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO, U.S.A.

NIAGARA

• NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

AMERICA'S MOST COMPLETE LINE OF

Presses, Shears, Brakes and other Machines and Tools for Sheet Metal Work

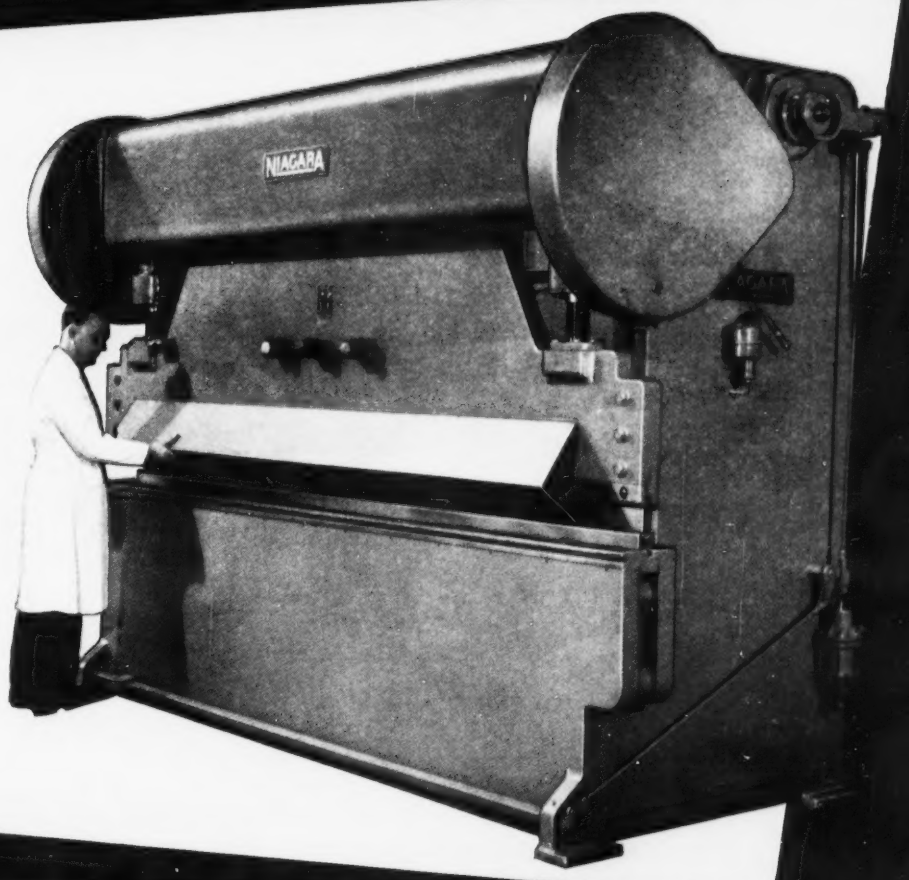
SO

Send your sheet metal problems to NIAGARA for unbiased recommendations on the most suitable equipment.

•

You can depend on NIAGARA QUALITY

Write for Bulletins



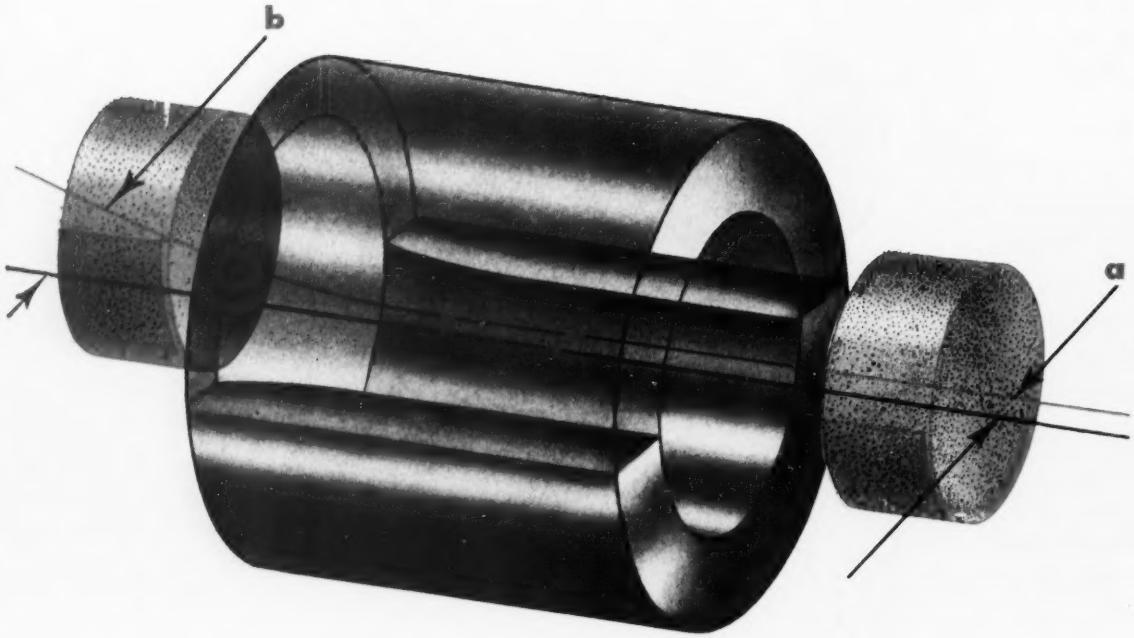


DISTRICT OFFICES: NEW YORK • DETROIT • CLEVELAND • PHILADELPHIA

Dealers in principal U. S. cities and major foreign countries

alignment

for better internal grinding

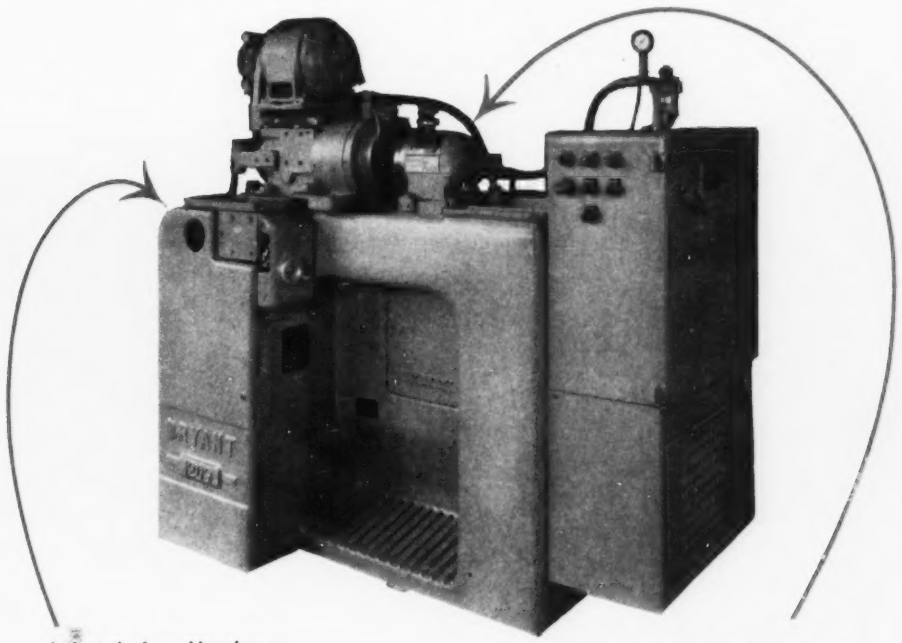


BELL mouth holes are a common internal grinding error. General available information advises simply turning the workhead or changing the length of traverse to correct this error, to generate a straight hole. In the case illustrated above, where bell mouth exists at one end of the hole, neither turning the workhead nor changing the length of stroke will correct this error.

In order to grind a straight hole the wheel must traverse the work in a straight line parallel to the axis of the work. The wheel path (the line in which the wheel traverses) is controlled by the slides under the wheelhead. If the slides are straight and true, the wheel path will be a straight line. If the path of the wheel varies from a straight line, the variation will be generated in the work.

At point "a" the wheel path and axis of the work are parallel and the wheel is set to grind a straight hole. Because of an error in the wheelslide

ways, the wheel path is distorted and the wheel is plunged into the back end of the work and the wheel path and work axis diverge as shown at point "b". Wheelslide error can introduce distortion of many types within the work in addition to the one illustrated. The remedy is to correct the wheelslide ways which will, in turn, straighten the wheel path. The wheel contact will be improved, resulting in better finish.



Left end of workhead may be raised or lowered to bring its axis into a plane parallel with wheelslide bar.

Rear of wheelslide may be adjusted to insure straight line motion of the wheel.

This machine is designed particularly for high production, precision grinding of bores up to 3" in ball bearing races, gears, rolls, bushings, etc. Operator merely loads work, trips a valve to start cycle and unloads the finished piece. The machine automatically rough grinds, finish grinds and returns to chucking position when finished size is reached. Wheelslide traverse is hydraulically operated, providing infinite traverse speeds and assuring smooth oscillation. Wheel speeds up to 100,000 R.P.M. are obtained with the Bryant Hi-Frequency Wheelhead. Write for folder.

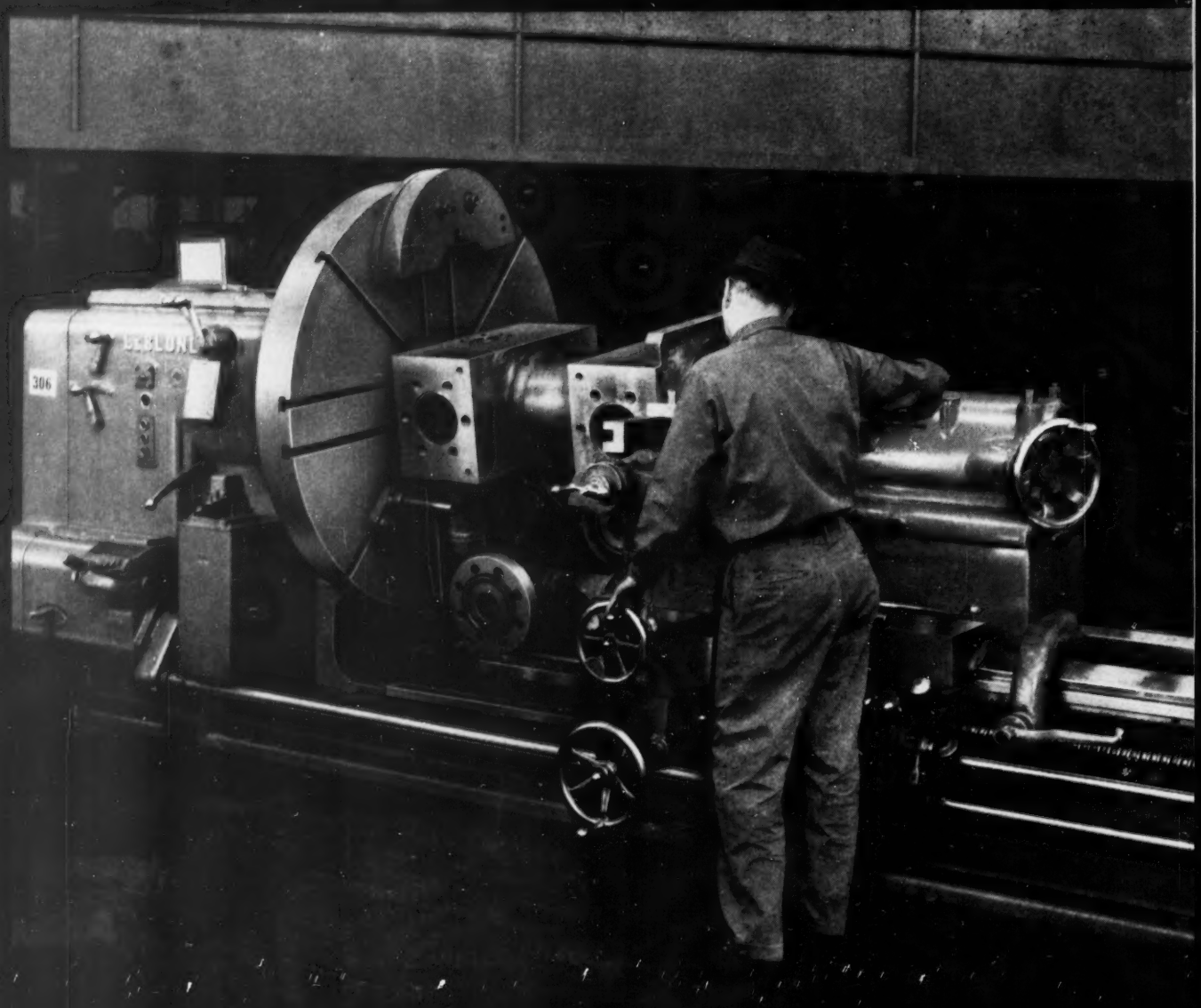
Write for "Alignment" booklet which gives complete details on this interesting subject. Also ask for booking form on new sound, color movie — free showings arranged for engineering groups.

Bryant Chucking Grinder Company

Springfield, Vermont, U. S. A.

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

Le Blond Gap Lathe stars in 16-hour Variety



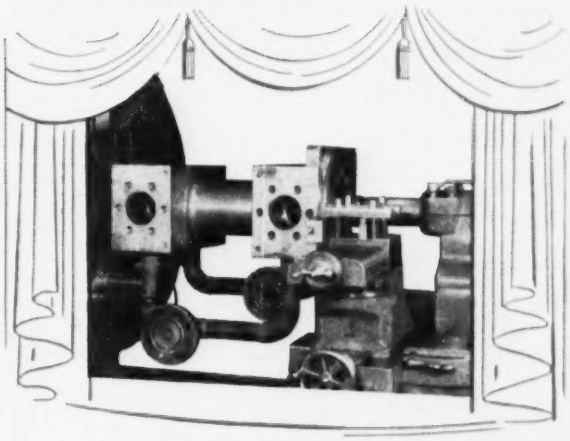
In operation shown, LeBlond 32"/60" Sliding Bed Gap Lathe is used to finish faces of compressor cylinder. Faces must be made parallel, square to bore. Extending manifolds require 78" swing. Job is supported on plug centers, weighs about 3 tons. Spindle speed, 76 rpm; feed, .010, 2 cuts; job time, approximately 110 minutes.

Show at Clark Brothers

Juggles Diameters From 6" to 78"

. . . Satisfies Critics

with Stellar Performance!



Clark Brothers Company, Olean, New York, had to "book" a one-lathe act—a single machine to turn out a wide variety of components for "Big-Inch" Type compressors. A special lathe for occasional large-diameter work was too costly.

"Talent scouts" at LeBlond's Buffalo distributor, The Buffalo Machinery Co., recommended their hottest variety number—a LeBlond 32"/60" Sliding Bed Gap Lathe.

Now this versatile machine performs 16-hours-a-day at Clark Brothers, takes the place of at least two machines. One specialty is truing-up and finishing heat-distorted compressor cylinders with manifolds already welded in place—faces must be made parallel. The sliding bed of the LeBlond Gap lathe opens up readily to meet the *78" swing requirement.*

With gap closed, it operates as a standard heavy duty engine lathe, turns power cylinders and cylinder liners *ranging from 6" to 30" diameters, requiring tolerances of ± .0015".*

The multi-purpose LeBlond Sliding Bed Gap Lathe is a sweetheart in the shop. Has adjustable gap and center distance. Four-way rapid traverse. Thirty-six spindle speeds are available, 5 to 500 rpm. Sixty feeds and threads. And, of course, you get all the well-known LeBlond features—hardened and ground steel bed ways, totally enclosed quick-change box, automatic lubrication, one-piece apron, thrust-lock tailstock and many more.

Whether your turning jobs call for versatility or production, heavy hogging or fine finishing, there's a LeBlond Lathe to turn them better, faster. Your LeBlond Distributor will tell you about the three Sliding Bed Gap Lathes, 16"/38", 25"/50", and 32"/60". Call him or write The R. K. LeBlond Machine Tool Company, Cincinnati 8, Ohio.

Ask for Bulletin SBG-103D for more information on LeBlond Sliding Bed Gap Lathes.

Cut with Confidence

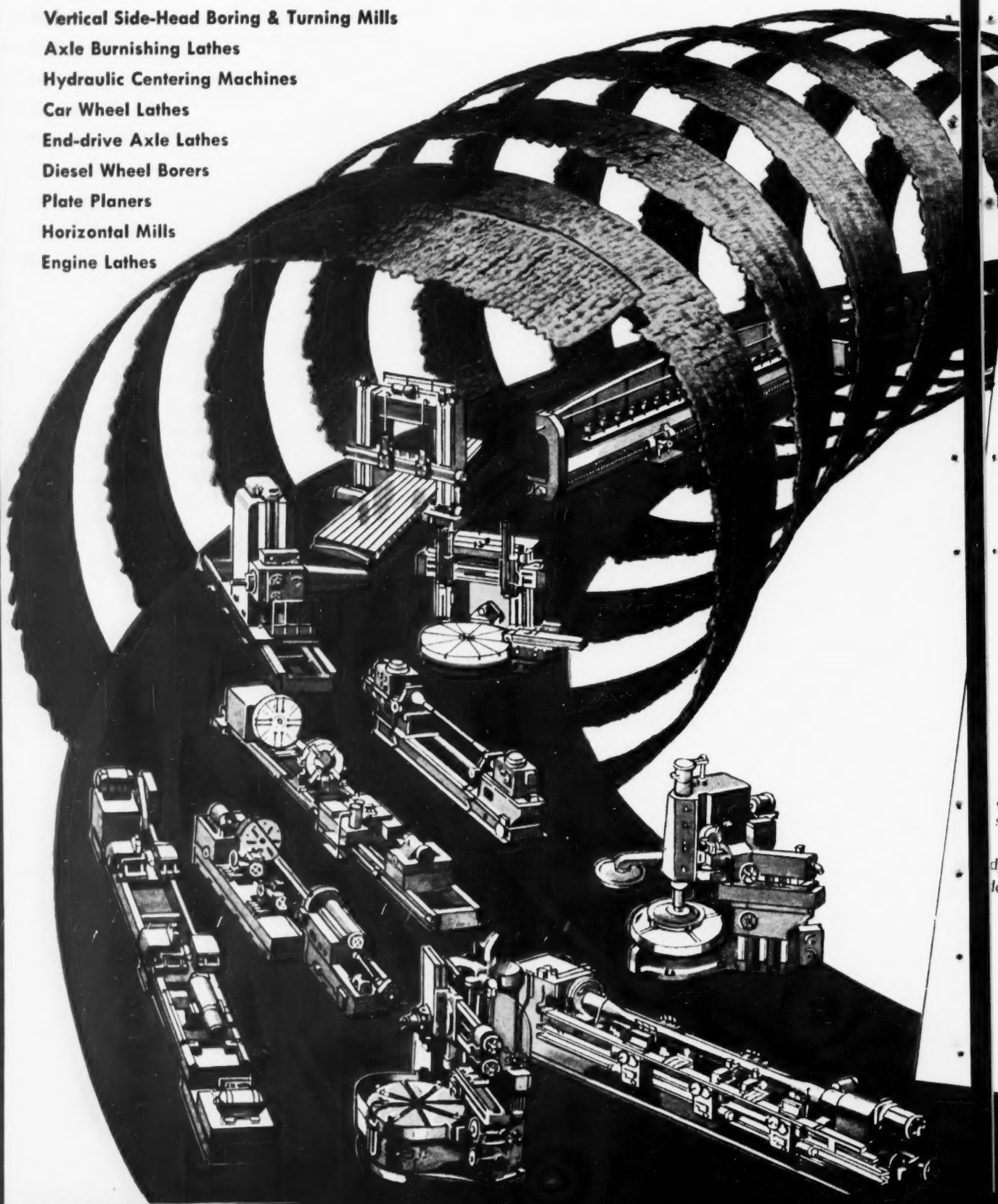
LeBLOND of Cincinnati

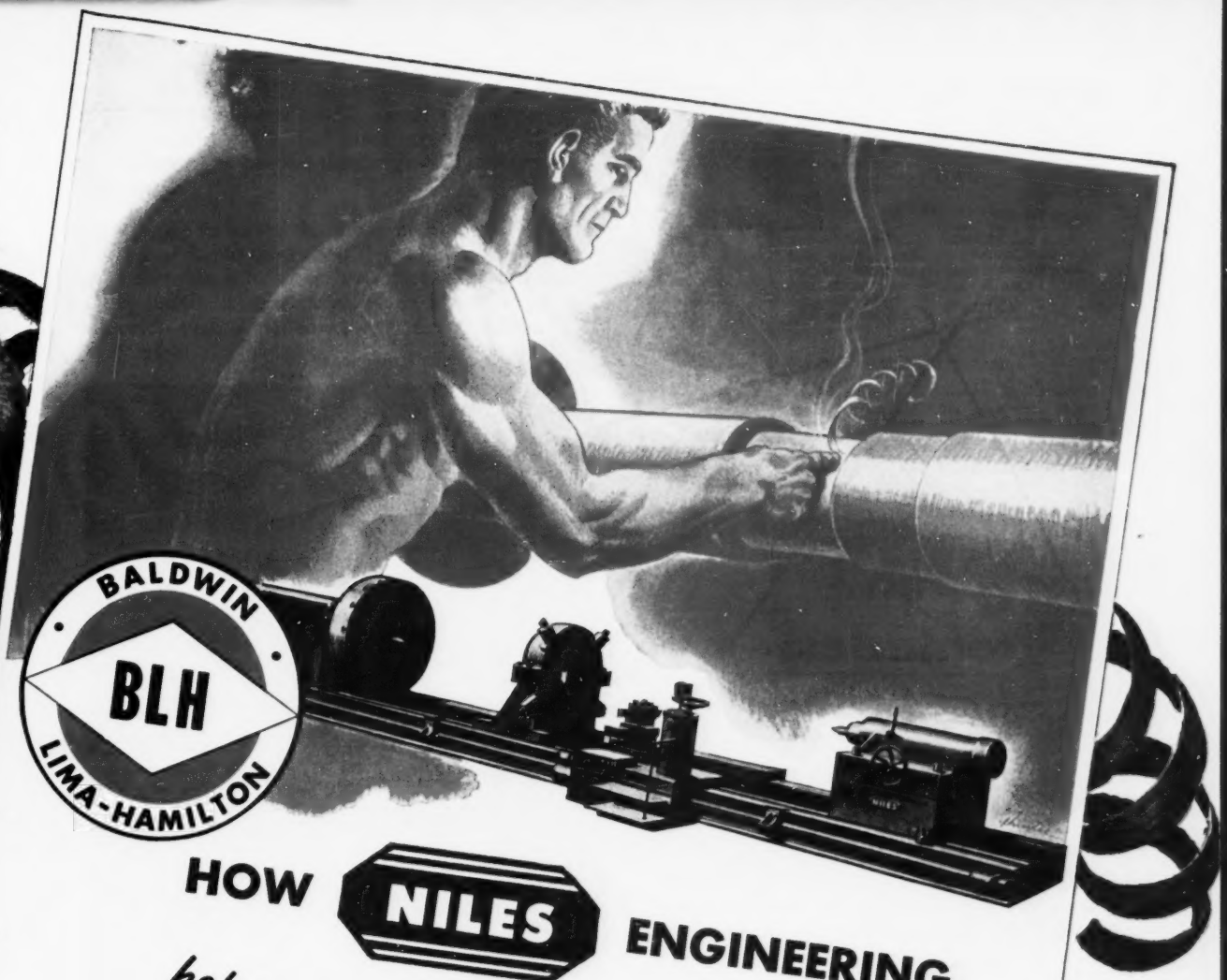
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 66 YEARS

... and each a "blue-chip" product

Boring Mills
Planers
Vertical Side-Head Boring & Turning Mills
Axle Burnishing Lathes
Hydraulic Centering Machines
Car Wheel Lathes
End-drive Axle Lathes
Diesel Wheel Borers
Plate Planers
Horizontal Mills
Engine Lathes





HOW NILES ENGINEERING

helps output take a turn for the better

Engineering machine-tool giants that can hog out ¾-inch chips . . . then finish cut to ten-thousandths . . . is our business here at Niles. And after a century of such specialization, we *know* how to engineer the big tools to give you big output.

How big a machine tool do you need? We've built many of the largest ever made . . . lathes with 10-foot swing . . . planers with a 23-foot clearance between housings . . . boring mills with 43-foot swing.

Do you need extra power? All Niles tools are designed with extra rigidity and more power . . . designed to shrug off the stresses of deep cuts and modern feeds and speeds with carbide tipped tools.

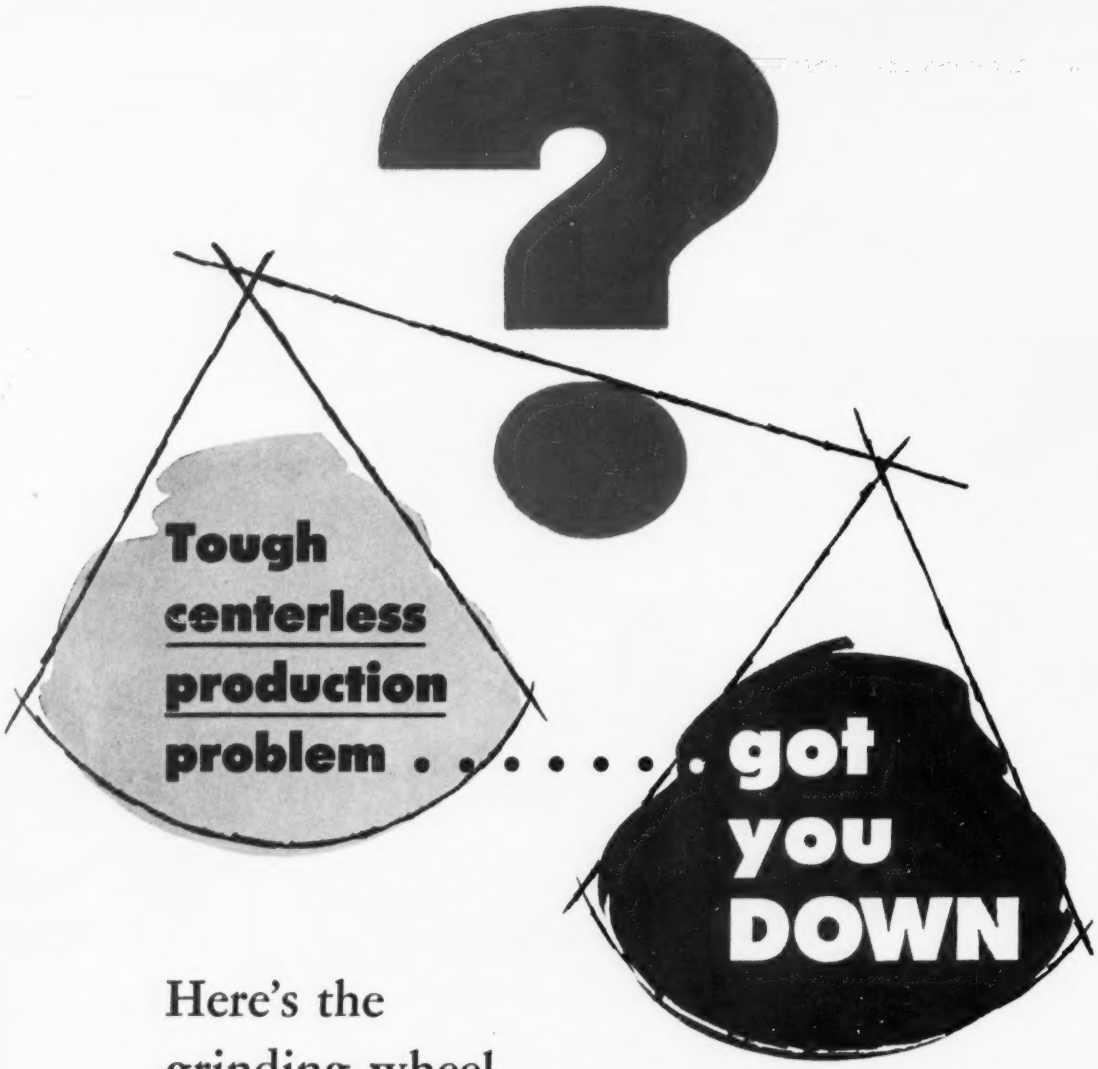
Do you need precision plus? We make Niles tools heavier and more powerful, but we also build them to the highest precision standards . . . build them to give you consistent, close, sustained accuracy. That's the reason they're top favorites with the close tolerance manufacturers of precision instruments, ball bearings, tools, dies, and other machine tools.

So why not check Niles when you tool-up. Niles is one of the *great* names in machine tools . . . and the payoff to you is in a *greater* output with *greater* accuracy, over a *greater* number of years.

Why not write *today* for Catalog 91551.

Write to
HAMILTON WORKS
Hamilton, Ohio

BALDWIN-LIMA-HAMILTON



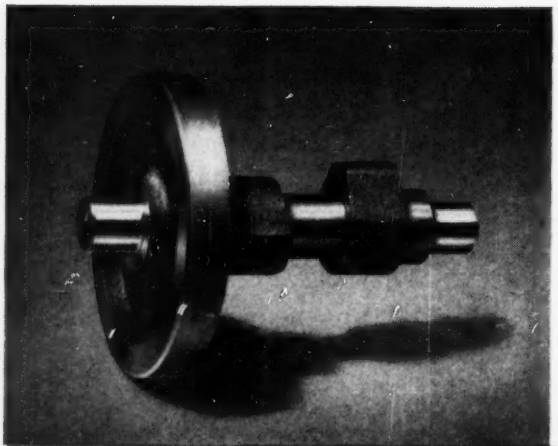
Here's the grinding wheel that will ABSOLUTELY solve it!

Here's why a CINCINNATI Grinding Wheel is *the smartest solution to tough production problems* in centerless grinding:

BECAUSE CINCINNATI WHEELS ARE MADE TO TEAM-UP WITH CENTERLESS GRINDERS

What's more, with a Cincinnati Milling-trained machinist on the spot to help you get the most out of CINCINNATI Grinding Wheels, you can count on the *right answer* – FAST!

And here's why we're so *positive* that CINCINNATI Wheels can help you:



Increasing production in grinding, while maintaining close tolerances, of this gear cam for an internal combustion engine presented difficult problem. For full story—and solution—see Case History at upper right.

1 CINCINNATI Grinding Wheels are used by—and *developed* by—Cincinnati Milling, which has done more research, had more experience and made more centerless grinders than any other organization in the world.

2 We've solved hundreds of centerless grinding problems using CINCINNATI Grinding Wheels. These problems have not been confined to production. They include a complete variety of centerless grinding troubles—such as roundness, taper, sizing, stock removal and finish.



Research worker shown here is using special equipment to check grinding wheel wear. This equipment gives consistent measurement of changes in wheel radius within .00005"

3 CINCINNATI Grinding Wheels represent 25 years of Cincinnati Milling research and practical experience on an entirely new approach to grinding wheels—the development of the grinding wheel as a true cutting tool.

How CINCINNATI Grinding Wheels Solved Tough Centerless Production Problem

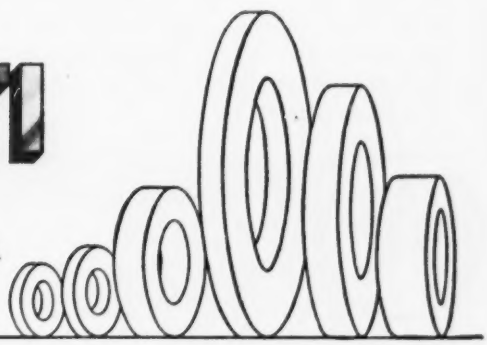
CASE HISTORY NO. 387

The job	Centerless grind by infeed method a spur gear and cam blank for internal combustion engine. Material — cast iron, 160-220 Brinnell. Stock removal — .005". Two diameters of .5000" and .4995", length 1/2" at each end, finish 15 RMS maximum, radius .025" maximum.
The machine	New Cincinnati # 2 Centerless.
The problem	Customer wanted to remove stock, maintain finish, hold .0002" for roundness, .0005" for size and grind at a rate of 125 pieces per 50-minute hour — in one pass.
The solution	Cincinnati Grinding Wheels machinists studied the problem and discussed it with production men and machine tool men. The result of this close cooperation was another notable solution to a difficult problem. Spacing between grinding wheels is critical because of the necessity for grinding extremely close to the shoulders on the part. The grinding wheels are ground on sides so that when used with a specially ground spacer the dimension between wheels can be held to plus .006". The wheels prescribed were two Cincinnati 2A100-N6-VL Wheels. The customer was able to grind 150 pieces per hour and hold 12 RMS finish. Three hundred pieces are ground between wheel dressings.

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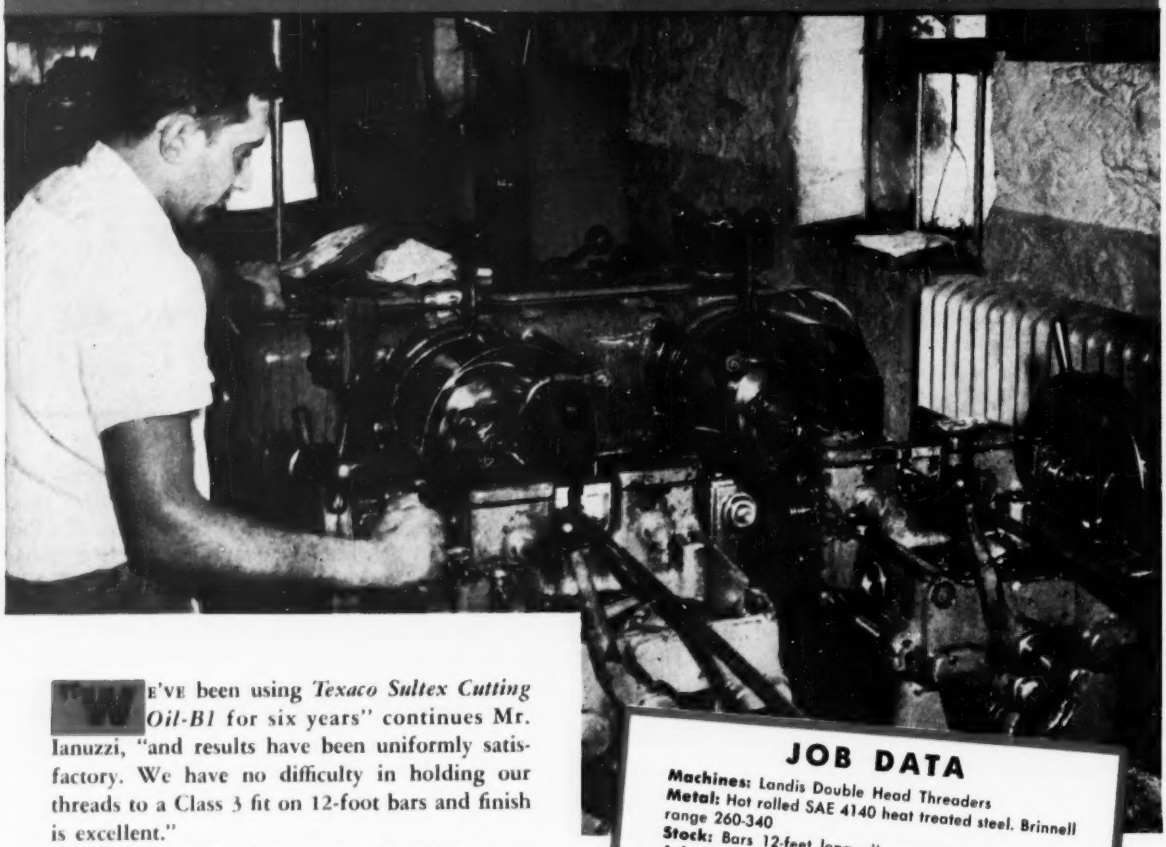
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By LORING F. OVERMAN

Government Encourages "Protective Construction" for Industry

POSSIBLY the next Washington development of major interest to the producers of machinery and machine tools will be a program of "protective construction." Protective construction—the dispersal of some industries and the bombproofing of others—is being considered with increasing concern in Washington. In the past, the idea of going underground had a foreign ring to it. Reading about this trend in England and on the Continent, Americans were inclined to conclude "But it can't happen here."

Inducements Announced

To encourage industry to get busy with protective construction, the Office of Defense Mobilization has issued a memorandum outlining procedures for processing applications for 100 per cent accelerated tax amortization. What such a program could mean to the machinery industries—both in protecting their own facilities and in assisting in the relocation of others—requires only imagination and an adding machine. It is significant that the first company to qualify for tax amortization under the new policy is a producer of machine tools, the Cincinnati Milling Machine Co.

In announcing the new policy, ODM observed: "It is the policy of the Office of Defense Mobilization to encourage the undertaking of protective construction measures in and around defense-producing facilities where the site is considered vulnerable to damage from blast by enemy attack . . . Accelerated tax amortization for the full cost of protective construction may be allowed for any defense-producing or defense-supporting facility, provided (1) it is located or to be located in certain critical target areas, as defined in the Federal Civil Defense Administration publication 'Target Areas' published February 4, 1952 (restricted); (2) the cost of such protective construction is $25,000 or more; (3) such cost is not deductible as business expense under Section 23a-1 of the Internal Revenue Code; and (4) the cost thereof is identified as attributable solely to protective construction."

How far the details of protective construction have progressed in Washington thinking is indicated by the fact that a concern may qualify for tax assistance only if the construction is undertaken according to protective construction standards.

Leasing of Government-Owned Machine Tools

The Pentagon has classified as "too weak" an ODM directive stating the conditions under which government-owned machine tools may be leased. It had been hoped that the policy would forbid the leasing of any tools for non-defense work, and that no tool "package" could be broken by the removal of any single tool important to the line.

As issued by ODM, the policy directive conceded that "packages" should not be broken, but did not specifically outlaw such action. Also, there was no outright ban on leasing machine tools for non-defense production. Defense officials felt that there was room, within the framework of the directive, to write interpretations which would accomplish the original objective of virtually freezing government-owned inventories of machine tools, except under conditions of serious emergency.

Machine Tool Advisory Group Meets

Members of the Machine Tool Industry Advisory Committee, which met recently in Washington, also had things to say about the ODM directive. They strongly opposed the sale of government-owned machine tools, and equally the idea of leasing them for any purposes other than production of defense items.

Members of the Committee also recommended that DMS Order M-41 be revised to permit a greater portion of the industry's output to go to non-defense industries. Now it is stipulated that 60 per cent of production be reserved to fill defense rated orders, leaving 40 per cent for non-rated orders. Due to the slackening of defense orders, the Committee suggested that the percentages be reversed. Members also recommended that the so-called "critical list" of machine tools, of which 70 per cent must go to defense orders, should be eliminated.

COMMITTEE members also urged that their industry be relieved of the requirement that order boards be submitted for inspection before proceeding with production and delivery schedules. They also urged that consideration be given to increasing to six months the present three-month freeze on production schedules for specified types of machines requiring long lead time.

A final recommendation of the Committee was that the new Business and Defense Services Administration undertake a study of the effect of machine tool imports on American industry. Also, they pointed out the severe loss of foreign markets since Korea. This outlet, they said, once accounted for 25 per cent of our machine tool production. BDSA officials promised to consider these several suggestions promptly.

NEGOTIATED by the General Services Administration up to August 1 were 114 pool order contracts and amendments covering 93,251 machine tools, parts, and accessories valued at $1,284,111,404. GSA's authority to make new commitments was frozen last March. As of August 1, 13,907 machines valued at $273,888,716 were still under contract, and 389 machine tools valued at $2,905,948 had been bought and placed in storage. Machines in storage are available for sale by the Government and by the producer at the current market price.

New Administrator for BDSA

Perrin G. March, III, president of the Cincinnati Shaper Co., has been appointed Assistant Administrator of the Business and Defense Services Administration, succeeding Samuel N. Comly. Mr. March has been serving since June 24 as Director of the Metal-Working Equipment Division of NPA.

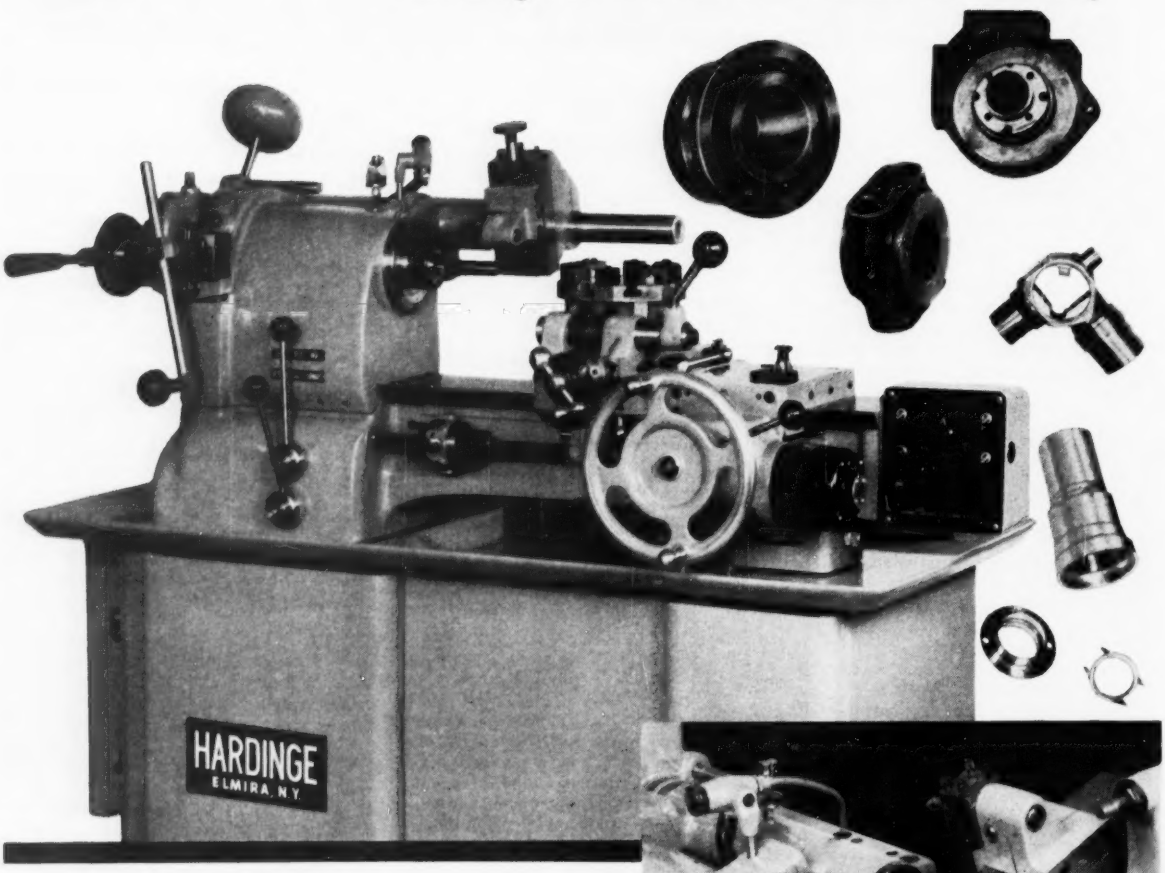
Mr. March is one of four BDSA Assistant Administrators who have charge of twenty-five industry divisions within this new agency. He serves without compensation and is on loan from his firm. He will be responsible for the following divisions: Agricultural, Construction, and Mining Equipment; General Industrial Equipment; Automotive; Electrical Equipment; Metal-Working Equipment; Business Machines and Office Equipment; General Components; and Shipbuilding, Railroad, Ordnance, and Aircraft.

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MACHINERY
DECEMBER 1953

What Percentage of Time Should a Machine Be Run?

EFFICIENCY has long been the watchword of American industry. It is this attribute that has enabled manufacturing plants to turn out end products at phenomenal rates of production and at costs within the range of the average pocketbook. In this day of automation, however, when the effort is being made to have machines operate as nearly as possible to 100 per cent of the working time, the fact is often overlooked that true efficiency may sometimes be attained by having the equipment idle a substantial part of the time.

There is one concern of moderate size in the Middle West that buys equipment on the basis that it must run 80 per cent of the time in order to be a profitable investment. Recently a vendor submitted a proposal to that company for an ingenious fixture that would turn out all of the work-pieces required in 40 per cent of the working day. The fixture cost was all right but the production rate too high according to the company's policy and the proposal was rejected.

The vendor pointed out the fallacy of this purchasing policy by suggesting facetiously that he could provide several posts at the front of the fixture which would inconvenience the operator and increase the loading time to the point where it would be necessary to keep the fixture in operation 80 per cent of the time in order to provide the required number of parts.

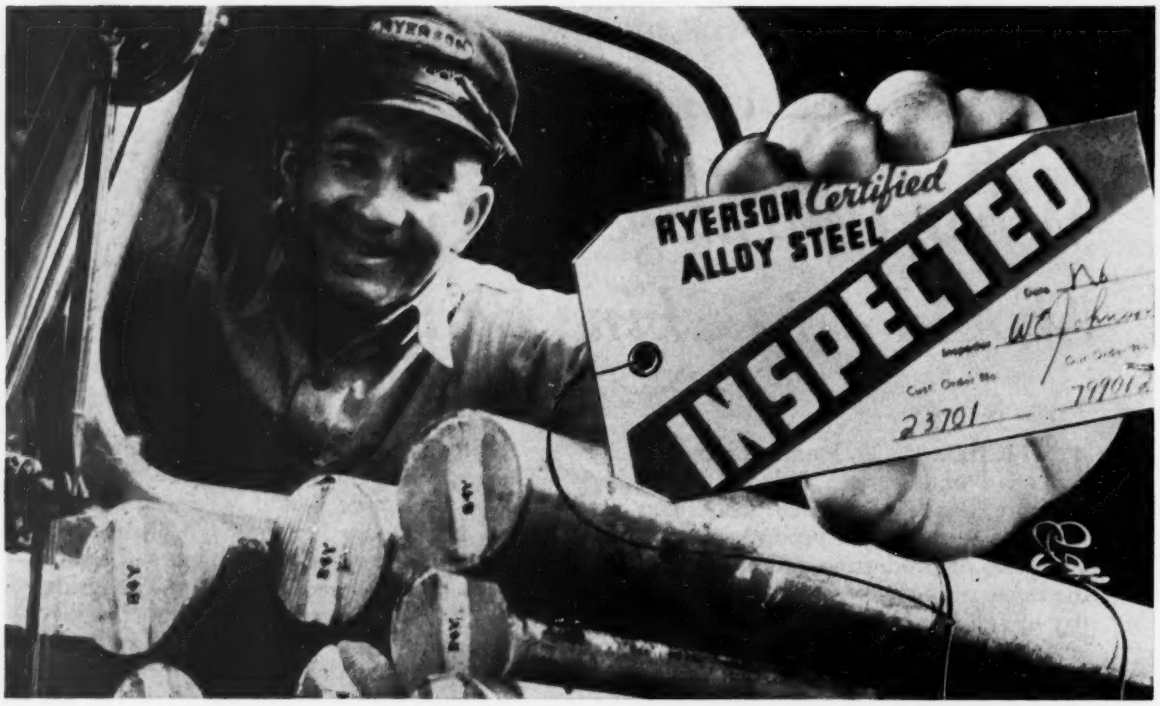
There is a prosperous tool shop in the Chicago area which is run on the principle that no toolmaker should ever need to wait for a machine to become available for his personal use. At least five machines of standard types are assigned to each man. Alongside each machine are racks holding all the different types and sizes of tools that are likely to be required in the operation of the equipment. Four machines may stand idle but the toolmaker loses no time in awaiting the release of a particular machine being used by another man or in visits to the tool-crib. True, the machines are of comparatively small size so that the capital investment is not prohibitive. Obviously, in this instance, the men's time is considered more important than the overhead charge.

Whichever manufacturing procedure is the most practical for the individual shop is a problem for the management to solve. Regardless of the shop concerned, one thing certain is that it never pays to use worn-out or obsolete equipment. And, according to a recent survey by the American Society of Tool Engineers, 28 per cent of production equipment in the metal-working industries is considered obsolete or inadequate by the users themselves, who admit the need of modernization or replacement.

First-class equipment and sagacious application of that equipment are the criteria of good management.

Charles O. Herb

EDITOR



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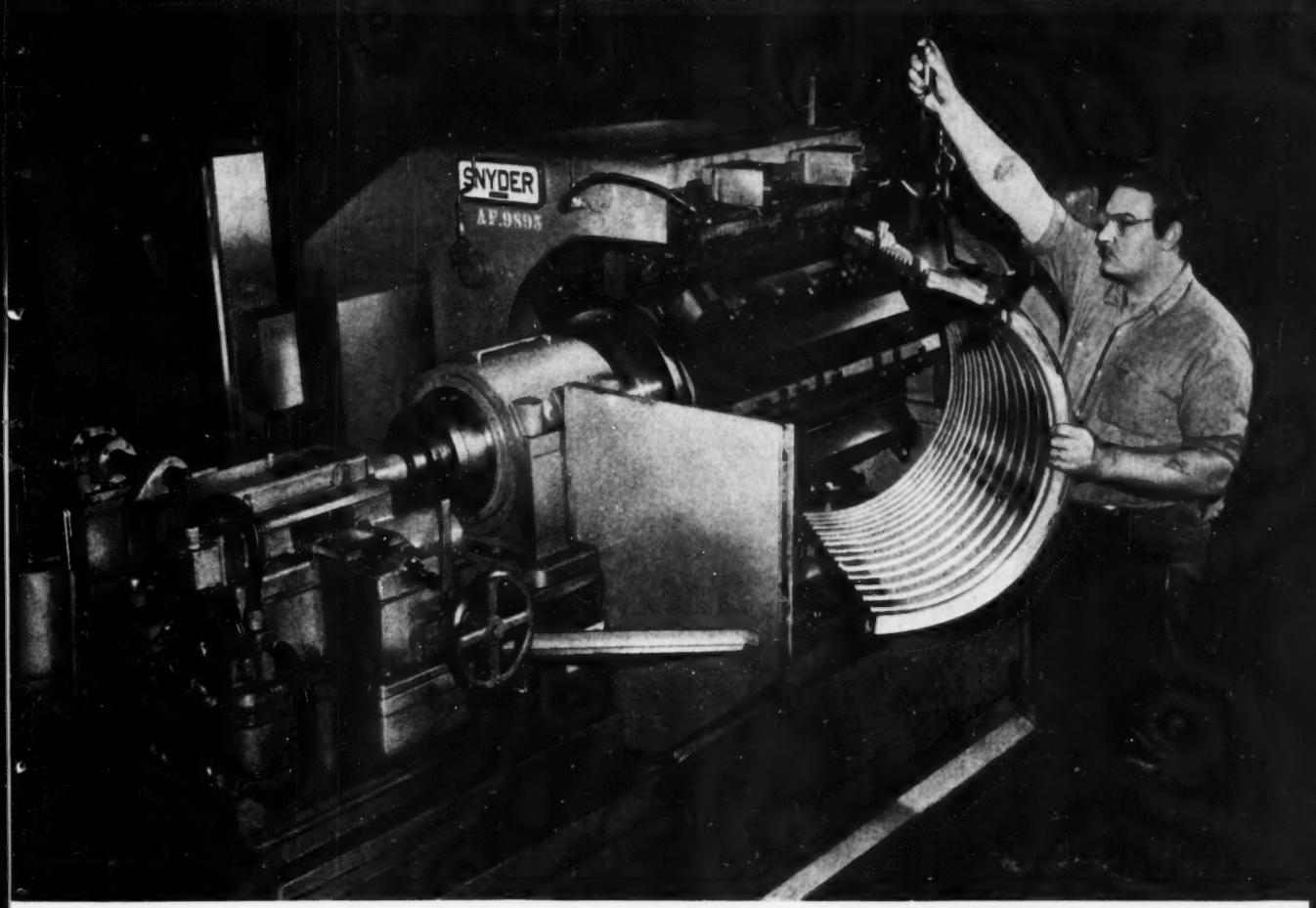
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Vol. 60, No. 4 MACHINERY December, 1953



How Buick Builds Sapphire Jet Engines

By Charles H. Wick
Associate Editor

THE Wright J-65 Sapphire is rated as one of the most powerful and efficient jet engines now being manufactured, having 7200 pounds of thrust and developing 13,000 H.P. at high speed. This engine is currently being produced in quantity by the Buick Motor Division of General Motors Corporation under a license agreement with the Wright Aeronautical Division of the Curtiss-Wright Corporation.

Buick has built, with its own capital, two large plants at Flint, Mich., covering nearly 2,000,000 square feet of floor space for the production of Sapphire jet engines. The machines employed for automotive manufacture are not adaptable to the extremely fine precision operations required in producing jet engines, so practically all of the machinery being used has been installed especially for this job. Some of the more outstanding operations performed in making high-quality precision parts for these engines will be described in this article.

Compressor housings for the Sapphire jet engines are cast in halves, split longitudinally. These housing halves are internally grooved,

counterbored, and faced—one at a time—on the Snyder grooving machine shown in the heading illustration and Fig. 1. Carbide-tipped tools are mounted on the eight-sided boring-bar. The work-piece is located from cast manufacturing lugs and manually clamped to a fixture that is cam fed toward the boring-bar during the machining stage of the operation.

The tools are staggered on the boring-bar to cut the grooves in each housing half, machine the two counterbores, and face both ends of each casting. Since the grooves are machined to different widths, the number of tools employed to cut each groove varies. The cam-controlled feed of the work-holding fixture is gradually reduced as the tools approach their maximum depth of cut so as to lower the load.

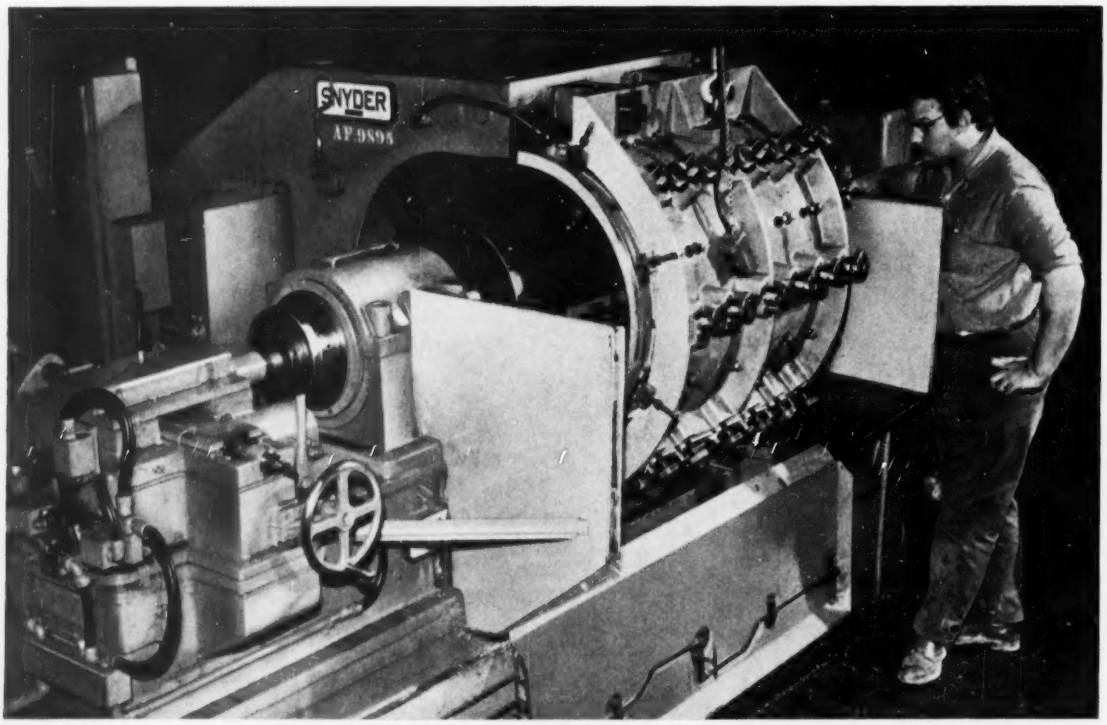
Because of the relatively thin wall of the compressor housing, the casting could easily be distorted by the force of the cutting tools in this operation. To prevent such distortion, a damper plate containing jack-screws that support the periphery of the casting is applied over the work-piece during machining.

The compressor housing halves are temporarily assembled by inserting pins in the holes of the manufacturing lugs (which are removed after machining has been completed), and the assemblies are finish-bored, faced, chamfered, and internally grooved on the Bullard Man-Au-Trol vertical turret lathe shown in Fig. 2. The assembled casting is secured to the rotary table of the machine by manually clamping the lugs and flanges at the bottom of the work-pieces.

The vertical turret lathe is equipped with both a left- and right-hand ram, and each ram has a horizontal and vertical Man-Au-Trol unit that automatically controls the movements of the ram. A hand-operated indexing turret at the lower end of each ram carries four carbide-tipped tools. Only one tool is cutting at a time, and the tool turrets are indexed 90 degrees between successive operations.

In an operation, tools on the left-hand ram, Fig. 3, feed automatically to counterbore and face the flange at the upper end of the compressor housing assembly. Then the T-shaped, carbide-tipped tool seen on the right-hand ram forms the upper five T-slots, and a similar tool on the left-hand ram cuts the lower nine slots. To form each T-slot, these tools automatically feed in to depth, up, down, then back to the center of the slot, and finally out. Repositioning of the tools and the feeding path are automatically controlled to cut each successive slot. Another tool on each ram chamfers the slots.

Fig. 1. Octagonal-shaped boring-bar of this machine is equipped with carbide-tipped tools for internally grooving, counterboring, and facing compressor housing halves.



Turbine and compressor rotor shafts and other parts of the Sapphire jet engine are contour-turned, faced, and chamfered on New Britain-Fischer hydraulic copying lathes, such as the one shown in Fig. 4. Smooth surface finishes, close dimensional accuracies, and high production rates are obtained with these machines. The copying attachment is in a vertical plane with the center line of the work, and the chips fall directly into the pan beneath the machine without interference. The location of the flat template (seen at the bottom in the illustration) on the front of the machine facilitates change-over or adjustment.

The entire hydraulic control system of this machine is enclosed in the carriage. Tool motion results from the difference of hydraulic pressure between a constant pressure chamber and an operation chamber. The movement of the tracer along the template closes or opens an aperture that increases or decreases the fluid pressure in the operation chamber. The pressure with which the tracer is held in contact with the template is very light, thus permitting the use of thin, unhardened steel templates.

The rear turbine rotor shaft forging shown being machined is finished in three operations. All of the machining is performed with one setting of the work, and the template is changed between successive operations.

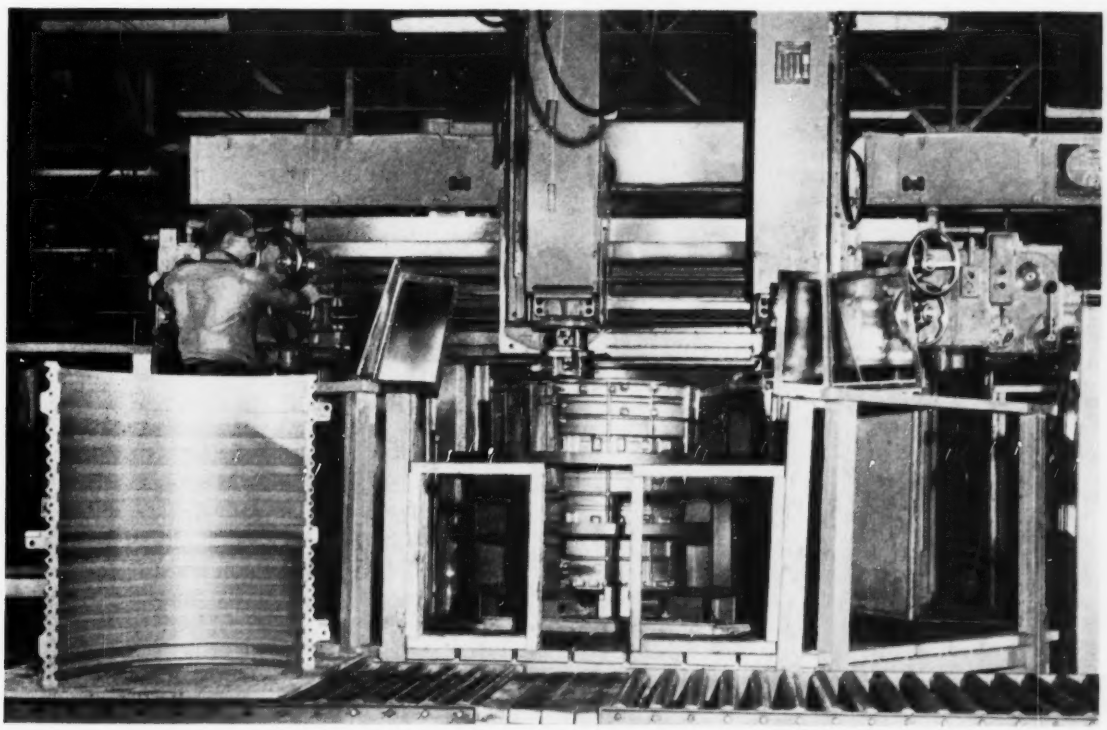
The opposite end of the rear turbine rotor shaft is contour-turned and faced on the Monarch-Keller form-turning machine illustrated in Fig. 5. The tool is guided in the work by means of a profile tracer which contacts a thin steel template, seen mounted on the rear of the lathe. Feeds in both the longitudinal and transverse directions are obtained through the use of magnet clutches that provide the drive to the carriage and cross-slide.

Front main-bearing supports for the engines are large castings. A number of holes in both sides of each casting are drilled, countersunk, and reamed on the Snyder four-station, automatic transfer machine shown in Fig. 6.

The cast bearing support is located in the fixture from the bore and previously drilled holes. Clamping is performed hydraulically through cams, and the fixture is automatically transferred from station to station and returned to the front end of the machine for unloading and reloading.

One of the many intricately shaped parts for the jet engine is the accessory gear-box housing. The gear pocket clearances in these castings are accurately machined, and the bearing liner seats

Fig. 2. Vertical turret lathe equipped with tooling on two rams, which are automatically controlled for boring, facing, chamfering, and grooving housing assemblies.



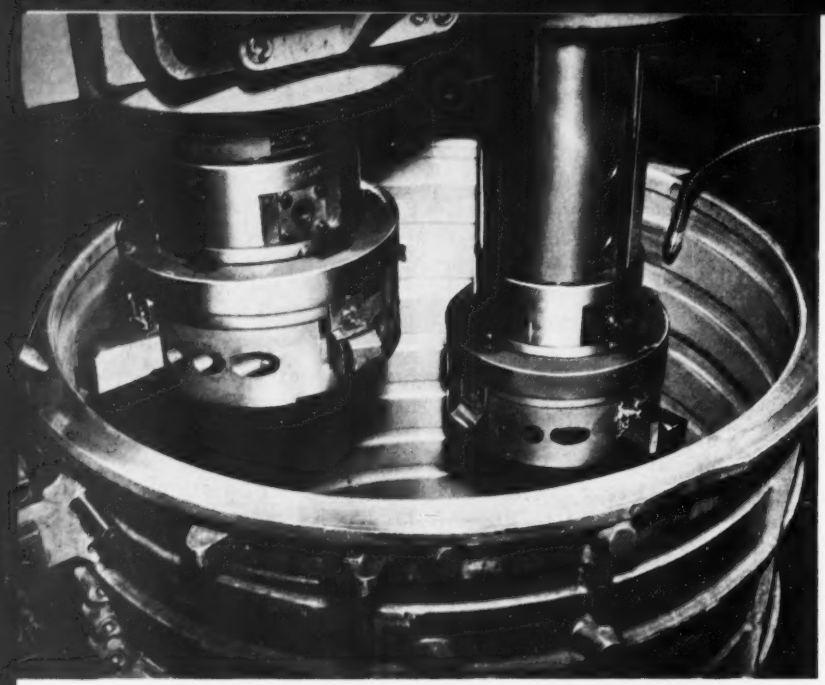
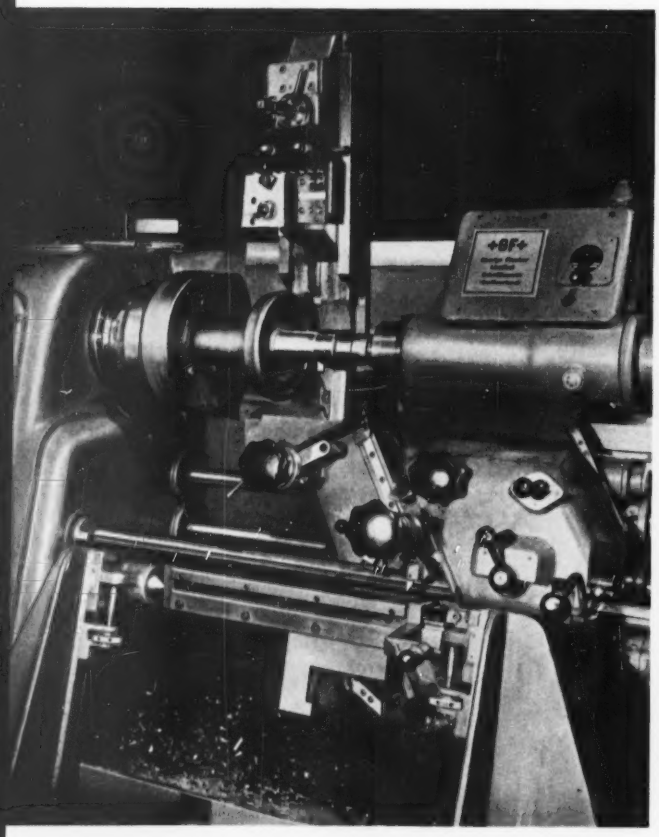


Fig. 3. Close-up view of the tooling mounted on the rams of the vertical turret lathe seen in Fig. 2. The lower end of each ram has a hand-operated indexing turret with four tools.

Fig. 4. Hydraulic copying lathe employed for contour-turning, facing, and chamfering rear turbine rotor shaft forging. Flat template can be seen at lower center.



faced, on the Cincinnati Hydro-Tel automatic profiling machine shown in Fig. 7.

The hydraulic tracer mechanism and template can be seen at the right, and a completed gear-box housing is shown at the lower left. Both rough and semi-finish operations are performed on the same machine with only one setting of the work. This is accomplished with the same template by changing either the diameter of the cutter or that of the tracer finger.

The accessory gear-box housings are finish-machined in an air-conditioned room that is maintained at a temperature of 68 degrees F. The casting housings are finish-bored, faced (at bottom of the bores), and chamfered on the Heald double-end precision boring machine shown in Fig. 8. One end of the machine (seen at the right) contains a six-spindle cluster head, and the other end contains two spindles.

Blanks for the main drive-gears of the accessory drive power take-off are machined on New Britain-Gridley eight-spindle chucking machines. One side of each blank is completed on the machine shown in Fig. 9, and the other side on a similar machine, both machines being attended by a single operator.

The forged gear blanks are loaded at the first station, as shown, and indexed to the second station, where the back face and one end are faced and the center is spot-drilled. Forming, turning, drilling, facing, and chamfering are completed at the third, fourth, and fifth stations. The drilled center hole in the forging is bored part way at the sixth station, bored through at the seventh station, and reamed at the eighth and final station.

The accessory drive-shaft for the Sapphire

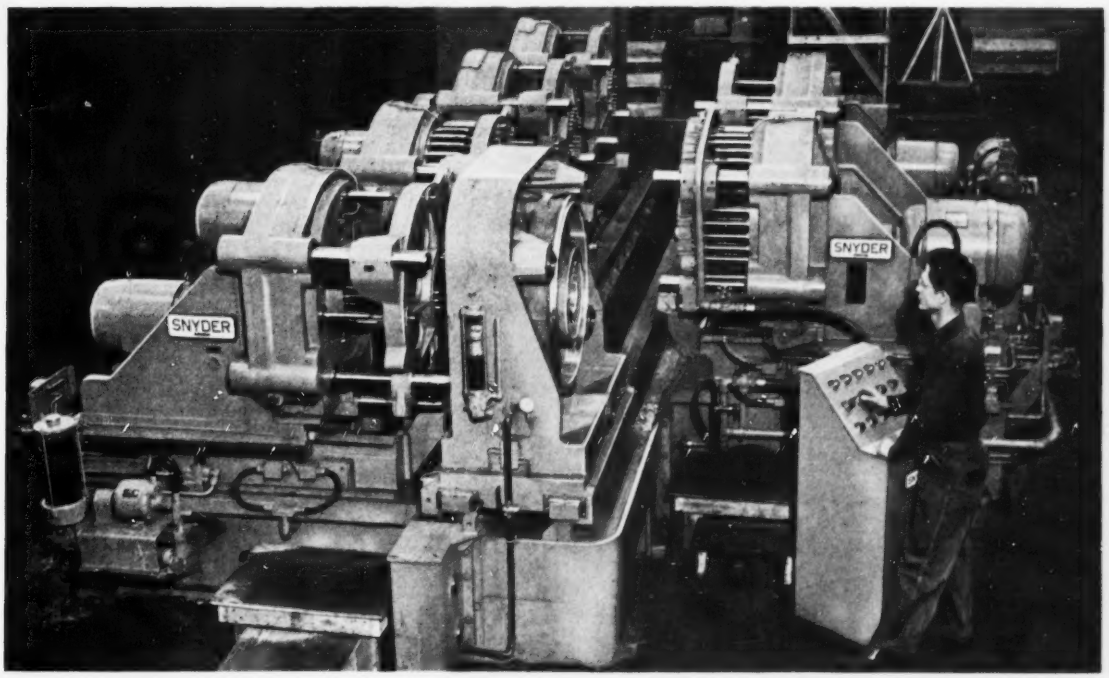


Fig. 5. Carbide-tipped, round-nosed tool is guided by profile tracer in contact with thin steel template (seen at the rear of the lathe) to contour-turn and face one end of turbine shaft.

jet engine is contour-turned, faced, and chamfered on the Fay automatic lathe seen in Fig. 10. The forged shaft is clamped in a hydraulically operated three-jaw chuck and supported on a tailstock center. Triangular carbide bits (which can be indexed 120 degrees and then turned upside down before resharpening is necessary) are employed for this operation, the three tools on the front being used for contour-turning, and the three on the back for facing and chamfering.

The tools are guided through the required path toward or away from the work by hardened and ground forming blocks mounted on the front and rear of the automatic lathe. Longitudinal feed of the turning tools is obtained by means of cams which are bolted to a drum at the headstock end of the lathe.

Fig. 6. Four-station, automatic transfer machine for drilling, countersinking, and reaming holes in both sides of front main-bearing support.



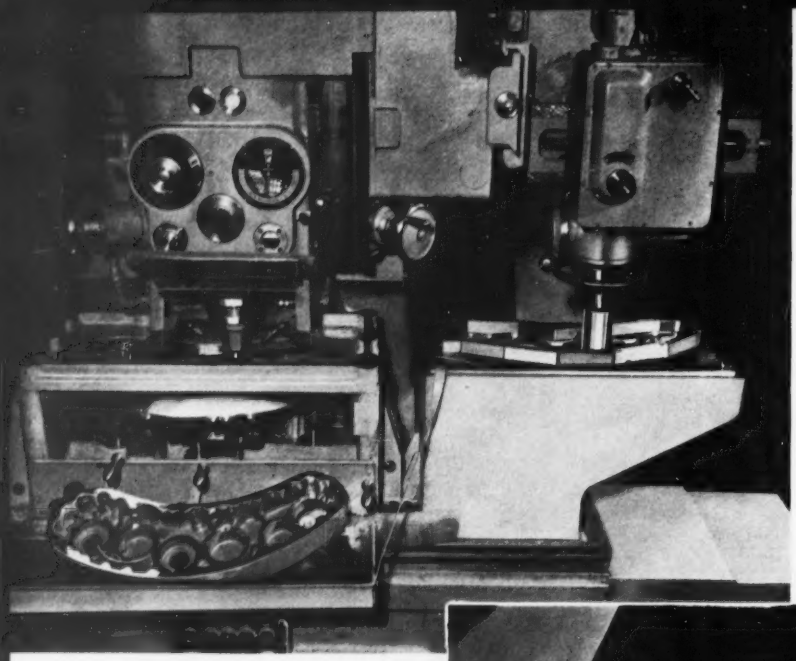


Fig. 7. Hydraulic tracer mechanism and template (right) on this automatic profiling machine is used to cut the gear pocket clearances and face bearing liner seats of housings.



Fig. 8. Gear pockets in accessory housings are bored, faced, and chamfered on this double-end precision boring machine, which is in an air-conditioned room.

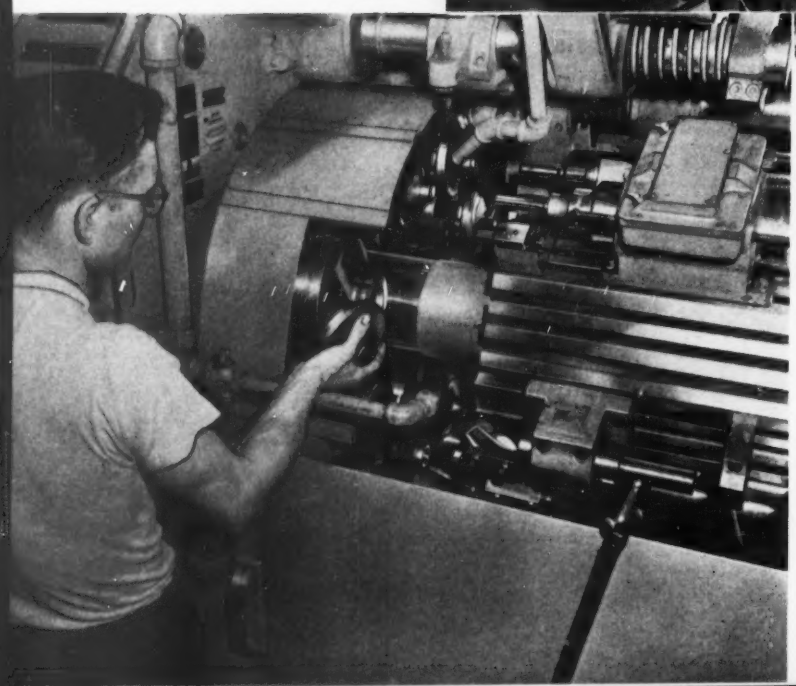


Fig. 9. Eight-spindle chucking machine used to machine one side of forged steel blank for main drive-gear of jet engine.

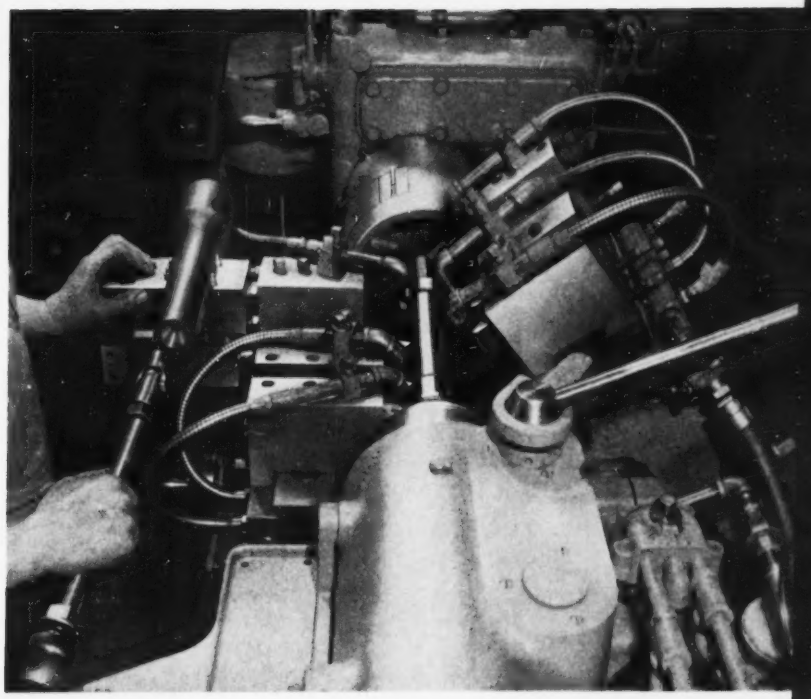


Fig. 10. Contour-turning, facing, and chamfering of the forged steel accessory drive-shaft are performed on this automatic lathe equipped with six triangular carbide bits.

Thin, large-diameter rings, of which there are many in the jet engine, present particularly difficult machining problems. One example is the outer labyrinth seals employed for thrust balancing of the jet engine rotor. These seal rings are machined on vertical turret lathes. A stress-relieving operation is required between successive operations.

The faces and bores of the six steps inside each labyrinth seal ring are ground on the Bryant internal grinding machine, Fig. 11. The depths to which the wheel is fed, and the locations to which the wheel-head is indexed, are controlled by stop-pins. Automatic dressing of the grinding wheel is obtained with the diamond attachment seen at the right. The operator is shown checking the depth of the steps with a multiple-pin gage. Two large-diameter pins locate on the periphery of the work-piece, while five smaller pins, which project various amounts, fit into the ground steps in the part.

All surfaces of the front main-bearing support are ground to final size in two set-ups on the Bryant two-wheel grinding machine shown

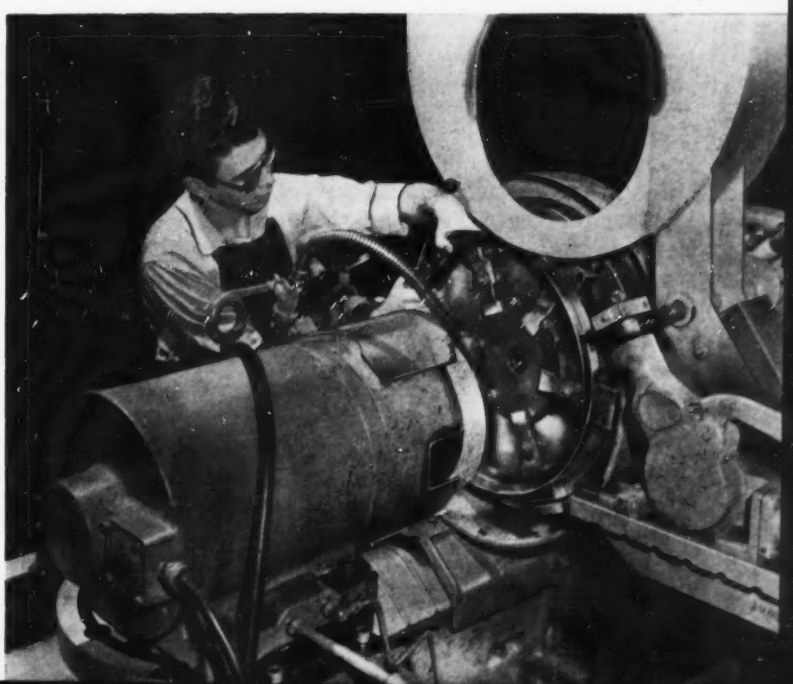


Fig. 11. Faces and bores of six steps inside a thin-walled, large-diameter labyrinth seal ring are finished on this internal grinder.

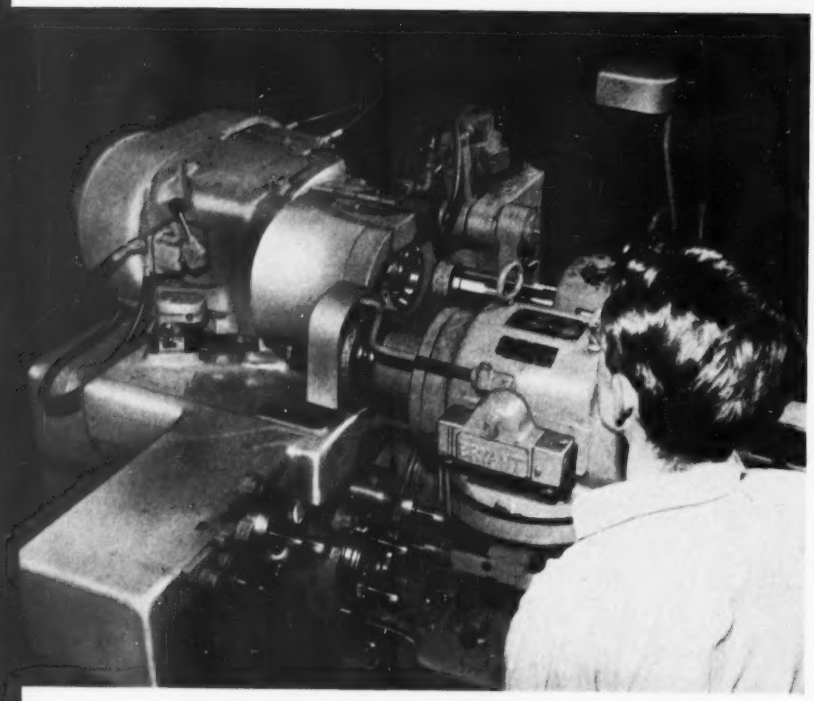


Fig. 12. Two-wheel grinding machine for finishing all the surfaces of forged steel, front main-bearing supports. Concentricity, parallelism, and squareness are held to close limits.

in Fig. 12. The required number of parts are first ground on one end. Then each part is reversed in the diaphragm chuck and its opposite end ground. The concentricity, parallelism, and squareness of all surfaces with relation to each other are maintained within close tolerances in this precision grinding operation.

In the first set-up on this machine, the smaller wheel seen at the rear is employed to grind the bore, the counterbore, and one face of the forging. The larger wheel at the front of the machine is dressed at an angle to grind a taper on the periphery of the part. In the second set-up on the same machine, the external front wheel is redressed for grinding another tapered surface on the periphery of the forging. Also, the internal rear wheel is dressed at an angle to grind a tapered surface in the bore.

American Gear Manufacturers Attend Meeting in Chicago

THE semi-annual meeting of the American Gear Manufacturers Association held at the Edgewater Beach Hotel, Chicago, Ill., October 25 to 28, inclusive, was one of the most successful in the history of the Association, both from the standpoint of attendance and the interest displayed in the technical sessions. One of the most productive sessions was devoted to a discussion of surface tempering caused by grinding after the presentation of a comprehensive paper on this subject by Gordon Murphy, vice-president, Foote Bros. Gear & Machine Corporation, Chicago, Ill.

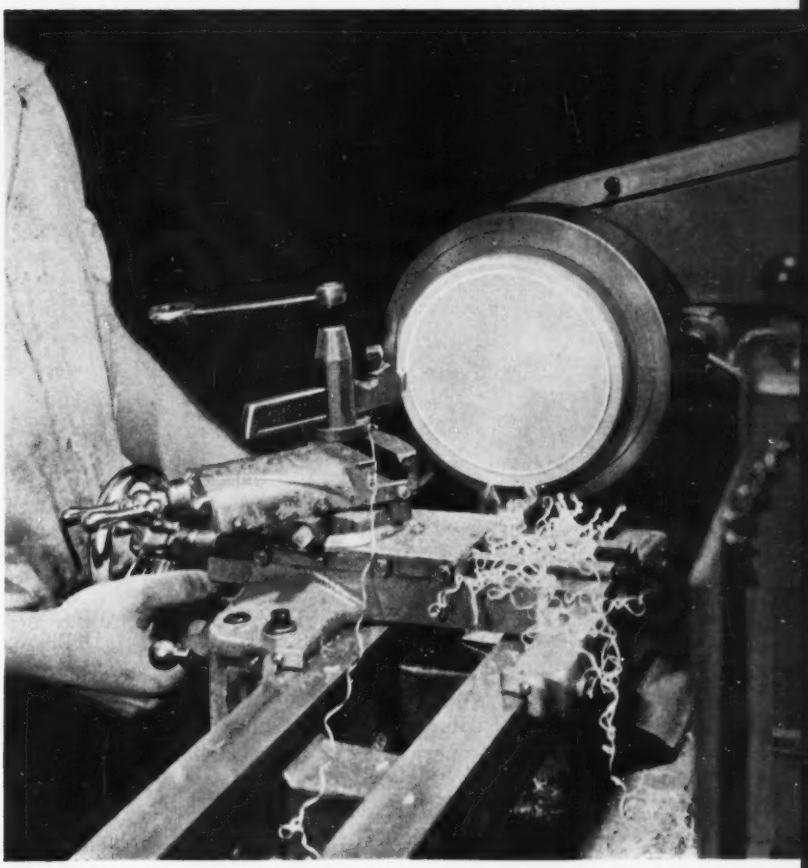
A panel discussion on the subject of using over-size worm-gear hobs also provided much interest after the presentation of stimulating papers by A. H. Candee, gear consultant, and A. Zamis, Illinois Tool Works, Chicago, Ill. D. W. Dudley, General Electric Co., Lynn, Mass., was chairman of this session. George H. McBride, Westinghouse Electric Corporation, East Pittsburgh, Pa., discussed a management development course conducted by Harvard University in one of the other sessions.

Mr. Candee was made a life member of the Association in token of his many years of service and in appreciation of his eminence as an authority on gears. He was presented with a leather-bound brochure filled with many letters of congratulation upon his retirement from the Gleason Works.

It was announced that the headquarters of the Association will be moved to Washington, D. C., in the early spring.

Production Machining of Nylon Rod Stock

By
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DURING the past decade, nylon has attained wide recognition among designers as a remarkably versatile engineering material. Its unusual combination of properties has led to use for items varying from bearings to human bone replacements, and from guides in wire-drawing machines to instrument timing gears.

Nylon parts find application in virtually all important classes of manufacturing equipment and as components of consumer goods. The majority of these parts are made economically by injection molding—a process that bears about the same relationship to the machining of nylon as die-casting does to the machining of metals.

A substantial number of nylon parts, however, are being machined from rod stock. Generally, this manner of fabrication is preferred where low-production requirements do not justify the cost of molds, or where tolerances are closer than can be maintained by molding. Fabrication from rod stock is also advantageous in producing flat surfaces, such as valve seats, and very small parts or shapes difficult to mold.

In Fig. 1 are shown a variety of small parts made from rod stock. As might be expected, machining nylon rod requires somewhat different techniques than those employed for metals. Once operators understand the machining characteristics of the material, close-tolerance work of good surface finish becomes routine.

Nylon has a relatively high melting point—just over 500 degrees F.—and rarely becomes gummed, melted, or crazed, as often occurs in machining plastics of lower melting point. It is extremely free-cutting, permitting heavy feeds in combination with surface speeds of 500 to 700 feet per minute. The material lends itself ideally to automatic screw machine work, where production rates often are in the range of 750 to 1800 parts per hour.

The practice of machining nylon follows that established for other thermoplastics. Since the thermal expansion of nylon is about ten times

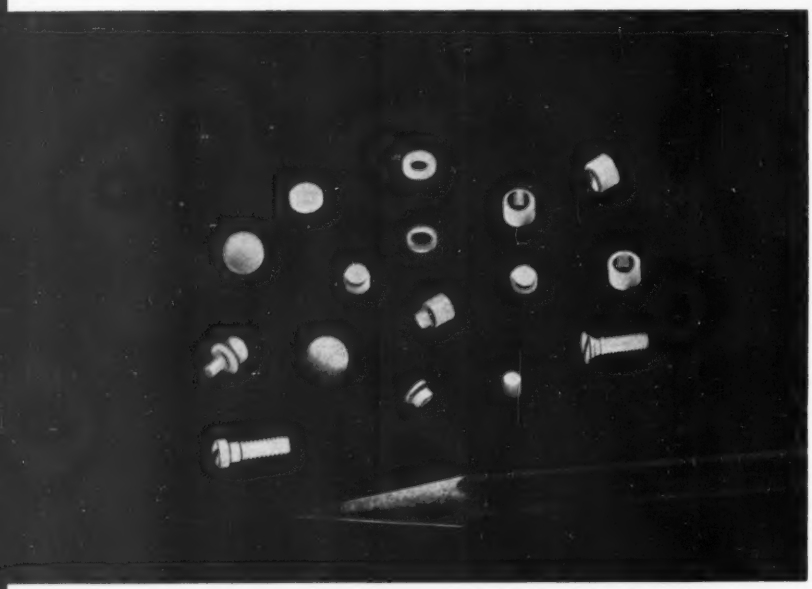
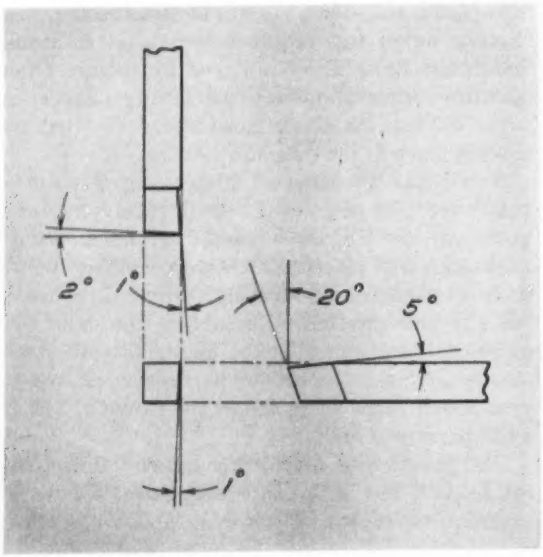


Fig. 1. Small but representative are these items machined from nylon rod.

that of steel, it is vital that the heat generated be kept to a minimum. Cutting tools must be sharp and carefully honed, and have adequate clearances to avoid rubbing. Coolants, preferably of the soluble-oil type, should be used in all high-speed operations. Coolant refrigeration units are reported to help in reducing tolerances and lengthening tool life. Also, parts should be brought to room temperature before dimensions are checked.

Virtually all drilling difficulties stem from improperly sharpened tools. The use of a drill grinder is mandatory to obtain the necessary point angles and to produce lips that are of equal length. If possible, a slow-spiral (low-helix) drill having polished flutes should be used.



This type of drill has a large flute area that permits a free discharge of chips. It should be ground to a point angle of 80 to 90 degrees, with a lip clearance of 9 to 15 degrees.

Drills must operate precisely on the center line of the machine, and should be "choked" as short as possible. Preparing the area to be drilled with a centering drill is desirable, but not always necessary. If used, it should penetrate the work sufficiently to leave a chamfer after the hole has been drilled, thus avoiding a raised lip at the point of entry.

The heaviest feeds possible that are consistent with the requirements of surface finish should be used so that unnecessary heat will not be produced. Maximum feed rates range from 0.005 to 0.007 inch per spindle revolution for a 1/16-inch drill, to 0.015 to 0.020 inch for a 1/2-inch drill. For drills above 1/2 inch in diameter, a feed rate of 0.020 to 0.025 inch is recommended. Maximum drilling rates, however, cannot be attained without proper use of coolants. A heavy stream should cool the drill in its return position, while a light stream should be directed at the point of entry.

If a slow-spiral drill is unavailable, a general-purpose drill can be used. For the general-purpose drill, an included point angle of 118 degrees and lip clearance of 10 to 15 degrees are satisfactory. The lip rake should be ground off, and the web thinned. To permit high-speed operation in shallow holes, one lip can be length-

Fig. 2. Negative back rake and ample front clearance are essential characteristics of this turning tool.

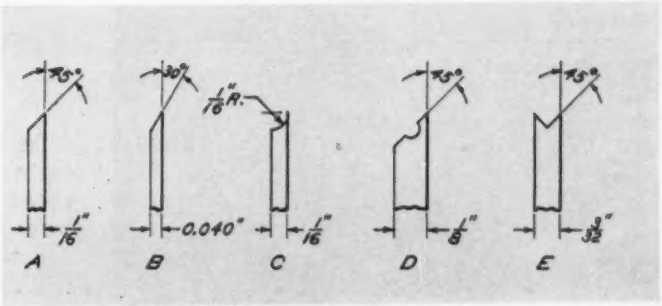


Fig. 3. Five examples of cut-off blades ground to suit a variety of conditions

ened slightly, so that the hole produced is somewhat larger than the nominal size of the drill.

Nylon is comparatively flexible. So, to prevent its deflection, turning should be performed by box tools where possible. Tangent type box tools, with either roller or V-rests, work well. The cutter itself should be set slightly below center. It should be ground to a radius and have a positive rake of from 0 to 5 degrees.

Because nylon turnings are long, tough, and stringy, they are not readily separated from the work. Chip-breakers ground into cutting tools have seldom proved effective. In some cases, it is desirable to use pick-offs as an aid in separating the turnings.

Plunge-forming operations are practical if the cutting surface of the tool is no wider than the minimum diameter of the work. Longer areas can, of course, be formed by using two or more tools, or by supporting the stock so that it will not be deflected. Either circular or dovetail form tools can be used. A front clearance of from 10 to 15 degrees is desirable, but as little as 5 degrees clearance has been used. Negative top rake of from 1 to 3 degrees is recommended.

The feed rate of the forming tool is determined to some extent by the deflection of the stock. In general, it is between 0.004 and 0.010 inch per spindle revolution. For screw machine work, serrated cams produce a momentary interruption of the feed, which is helpful in breaking up the chip ribbon. A good practice is to reduce the feed rate toward the very end of tool travel to obtain a clean and accurate surface.

Single-point turning tools can be employed to advantage in many operations. Best results are obtained by using a turning tool ground as shown in Fig. 2, and supporting the rod in some manner against deflection.

Nylon, like other plastics, is "notch-sensitive." Therefore, a thread with a rounded root, such as a Whitworth thread, should be specified to obtain maximum strength. Self-opening dies with chasers of high-speed steel should be used for threading on automatic equipment. High-speed steel taps, chromium-plated 0.002 to 0.005 inch over size, are required for accurately tapped holes.

As a rule, spindle speeds for threading and tapping are below those for drilling and turning; otherwise the first few threads may tear. The likelihood of this occurrence may be further reduced by chamfering the hole preparatory to tapping, and by providing a positive feed for the first few threads. Threads may also be cut with a single-point tool, in which case the depth of cut per pass should be at a maximum of 0.007 to 0.010 inch for quality work.

Cut-off operations are performed with conventional blade type tools. The blade must be square to the work to prevent creating a convex or concave surface. It should have a minimum of overhang, and have ample side clearance to work cool without rubbing. A zero or negative back rake—never a positive back rake—is recommended. A copious flow of coolant must be provided to prevent melting of the stock.

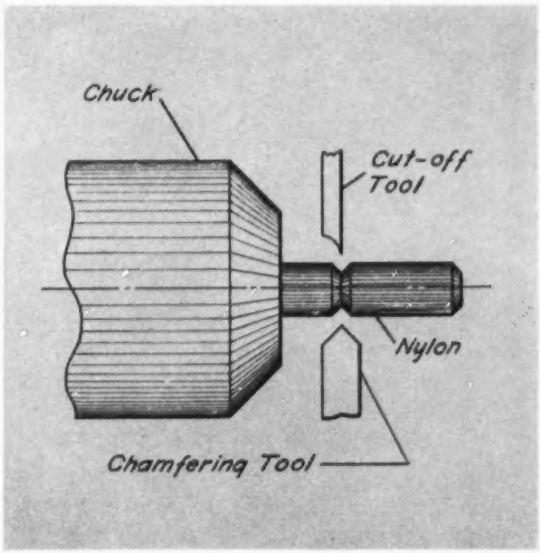


Fig. 4. The chamfering tool is employed to prevent the cut-off tool from leaving a lip.

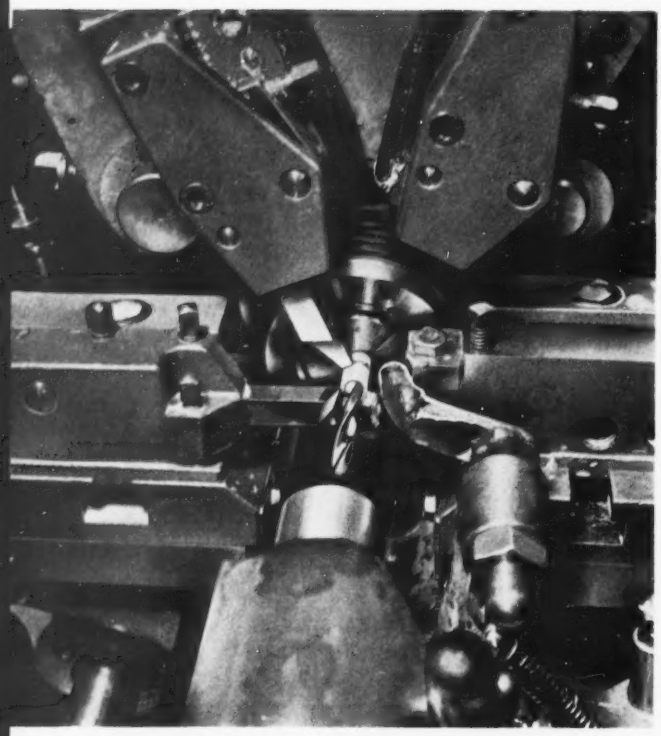


Fig. 5. After the rod is drilled, the chamfering tool produces a vee in the cut-off area.

The blade styles shown in Fig. 3 are commonly employed. Blade *A* can be used for many general-purpose jobs. On thin-walled bushings, blade *B* works well. Blade *C* is used where it is essential to avoid a nib at the cut-off point, and blade *D* on large-diameter rods or thick-walled bushings. Blade *E*, in addition to parting the stock, also faces the subsequent work-piece in the lot, and is used where a separate facing tool is not provided in the set-up.

A slight burr is nearly always raised by the cut-off blade at its point of entry, unless the work is prepared with a chamfer. Before cutting off, a good practice is to form a vee in the surface with a cutter mounted on the machine cross-slide, as shown in Fig. 4. The illustration Fig. 5 shows an actual set-up. In this particular operation, the nylon rod is drilled and chamfered on an automatic screw machine.

The blade should be kept sharp, as a dull cutting edge would leave a burr at the end of the cut. Having the cut-off tool dwell near the terminal point of the cut permits the work to fall free. (On automatic screw machines, the cam for the cut-off tool can be designed for this.)

Cut-off feed rates of from 0.002 to 0.010 inch per spindle revolution prove satisfactory, the coarser rate being reserved for relatively heavy tools. In Fig. 6 is shown a cut-off operation in progress. The tool in the front slide is curved to the diameter of the rod and serves as a steady-rest during the cut.

* * *

Scrap Ends of Pipe Painted Automatically

Machines installed at the Ambridge, Pa., plant of the Spang-Chalfant Division, National Supply Co., are equipped with ingenious devices actuated by X-ray to determine the wall thickness of steel pipe. Paint is automatically sprayed on any areas of the pipe which are less than the required thickness. The paint marks permit accurately cutting off only the under-gage sections at the ends of pipe as scrap. In this way, pipe of the required wall thickness is not wasted. Also, the possibility of having to take an additional cut is eliminated.

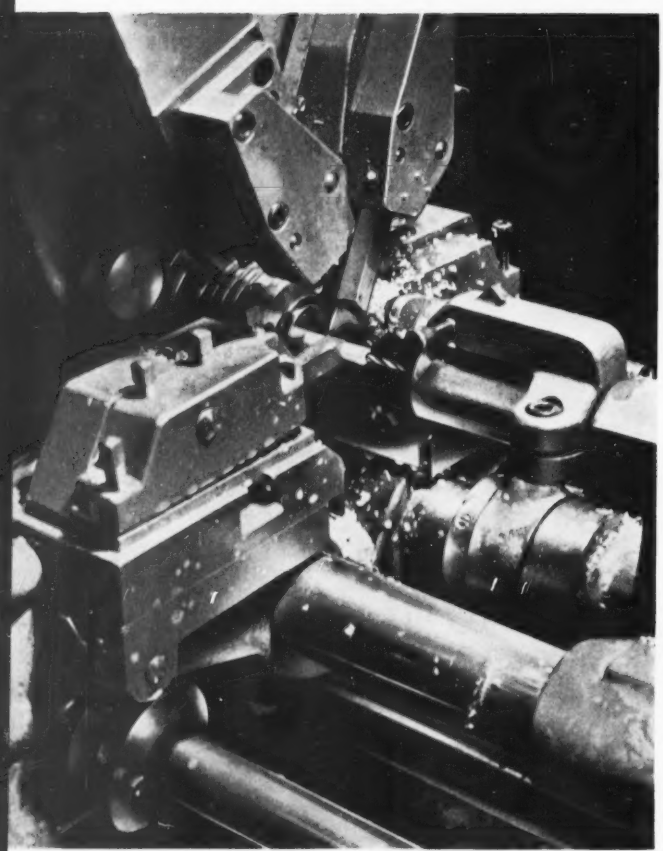


Fig. 6. The support in the front slide prevents the rod from deflecting as it is cut off.

Methods that were Used for Hydra-Matic Production



Unique methods employed at the Livonia, Mich., plant of the Detroit Transmission Division, General Motors Corporation, prior to a devastating fire—the worst disaster in the history of the automobile industry—are described in this article. Similar set-ups will probably be used in new manufacturing facilities

By Charles H. Wick
Associate Editor

OUTPUT of Hydra-Matic transmissions has been constantly boosted to meet the unprecedented demand for these units in Cadillac, Oldsmobile, and other automobiles; G.M.C. trucks; and many military vehicles. Early this year—prior to the disastrous fire—the four millionth Hydra-Matic commercial transmission came off the assembly lines at the Livonia, Mich., plant of the Detroit Transmission Division, General Motors Corporation.

Many ingenious methods were devised to relieve bottlenecks and reduce costs of producing automatic transmission parts. Several of the more unusual set-ups formerly employed, which will probably be used again when the manufacturing facilities are rebuilt, are described in this article.

From nine to eleven helical pinions of various sizes are required for the planetary units of each Hydra-Matic transmission, and the acute-angle ends of the gear teeth on the sides of each pinion must be chamfered. Formerly, this was a slow, costly operation performed with fly-cutting tools prior to hardening of the gears. Then a method was devised for grinding the chamfers on the gear teeth after hardening, at greatly increased

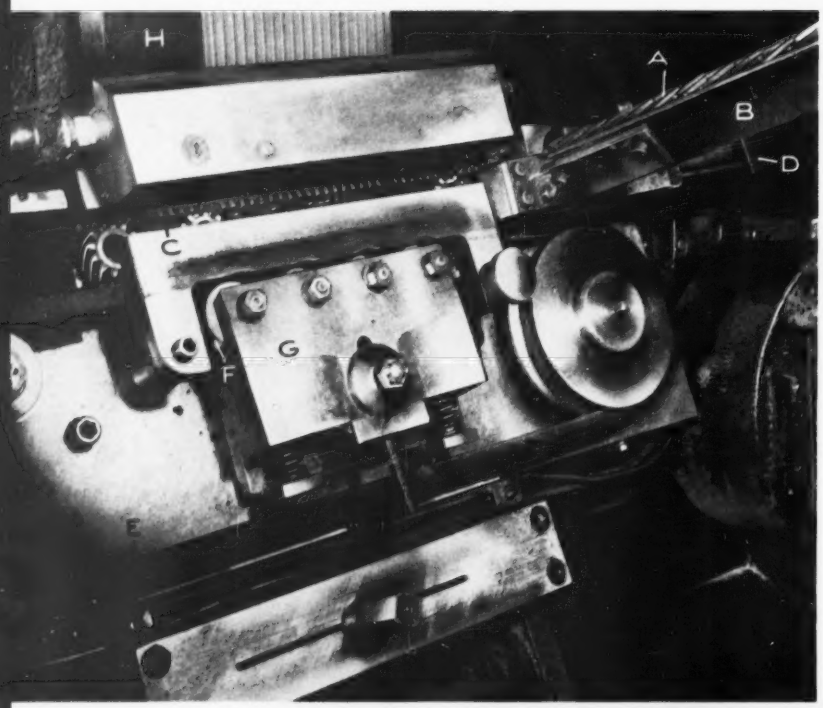


Fig. 1. Close-up view of the special automatic machine, shown at left in the heading illustration, which ground the chamfers on gear teeth

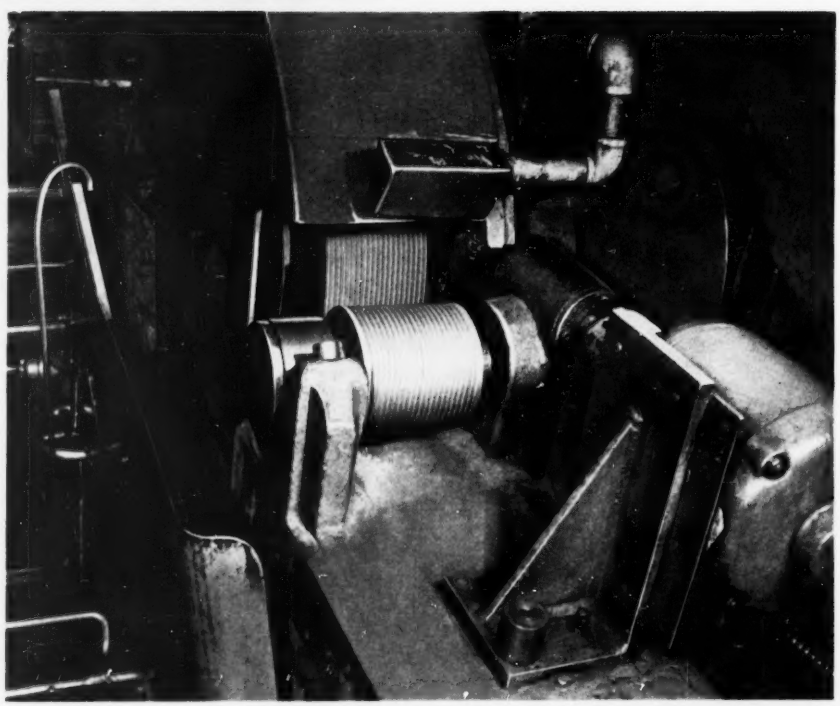


Fig. 2. Power-driven, hardened steel crusher roll was mounted on the rear of the machine to crush-dress the abrasive wheel.

production rates and less cost, by means of an automatic operation performed on a special machine designed and built by Detroit Transmission. Also, with this improved set-up the pinions were automatically transferred to another special machine, in which an oil groove was ground on both faces of each work-piece. This was previously performed on an independent machine that required handling of the work between machines, reloading, and unloading.

The tandem arrangement of these two unique machines is shown in the heading illustration, the chamfer grinding machine being at the left and the groove grinding machine at the right.

A close-up view of the chamfer grinding operation is seen in Fig. 1. The pinions *A* to be chamfered were manually loaded into magazine *B*, from which they were automatically transferred, one at a time, into mesh with a rack *C* by the piston-rod of hydraulic cylinder *D*.

An endless, continuously moving ribbed belt *E* kept the pinions in mesh with the rack. Rollers *F*, mounted on a spring-loaded block *G*, kept the belt in contact with the pinions. As the pinions were rotated along the rack, each rib on the formed abrasive wheel *H* ground the desired chamfer on the edge of one tooth.

After passing the left-hand end of rack *C*, the pinions fell through an opening onto another ribbed belt which carried them back (to the right and under the grinding wheel, thus chamfering the other side) and dropped them onto a gravity chute leading to the groove-grinding machine shown at the right in the heading illustration.

The grinding wheel, 24 inches in diameter by 6 5/16 inches wide, was crush-dressed to the required form by means of a power-driven, hardened high-speed steel crusher roll, which was mounted on the rear of the machine as shown in Fig. 2. A vitrified-bond (L grade), aluminum-oxide abrasive wheel of 180 grain size was employed in this set-up. On the average, the grinding wheel had to be crush-dressed only once every sixteen hours—or, since the machine completed 900 pinions per hour, after chamfering about 14,400 pinions. Different width wheels and formed crusher rolls were employed for chamfering various pinions of the Hydra-Matic transmission.

At the end of the gravity chute, each pinion fell into a pocket on the periphery of a work-carrier wheel. This wheel carried the pinions down between opposed abrasive wheels, Fig. 3, which ground an oil-groove in both faces of each work-piece. A chain retained the pinions in the carrier wheel pockets until they passed the grinding wheels, at which point they fell into tote pans.

Vitrified-bond (I grade), aluminum-oxide abrasive wheels of 100 grain size were employed for groove-grinding. When new, the wheels were 16 inches in diameter and 1/4 inch thick. Diamond wheel dressers, one of which can be seen at the lower right in Fig. 3, produced the required 3/16-inch radius on the peripheries of the abrasive wheels. Because the pinions were carried between the wheels on an arc (depending upon the radius of the work-carrier), the oil-grooves ground in the faces of the pinions were slightly curved. This did not, however, interfere with the purpose for which the grooves are designed, that of carrying oil.

High-Speed Turning and Flame-Hardening of Flywheels

The flywheel for the transmission is unique in that it is a single stamping, made from S A E 1045 steel. The flywheels were turned and faced at cutting speeds up to 700 feet per minute on Gisholt automatic lathes with special features, such as the one shown in Fig. 4. To permit using such high cutting speeds, conventional lathes were modified by increasing the horsepower of their driving motors from 10 to 25, heavily guarding the machines for safety, and developing a special brake to quickly stop the spindles from rotating.

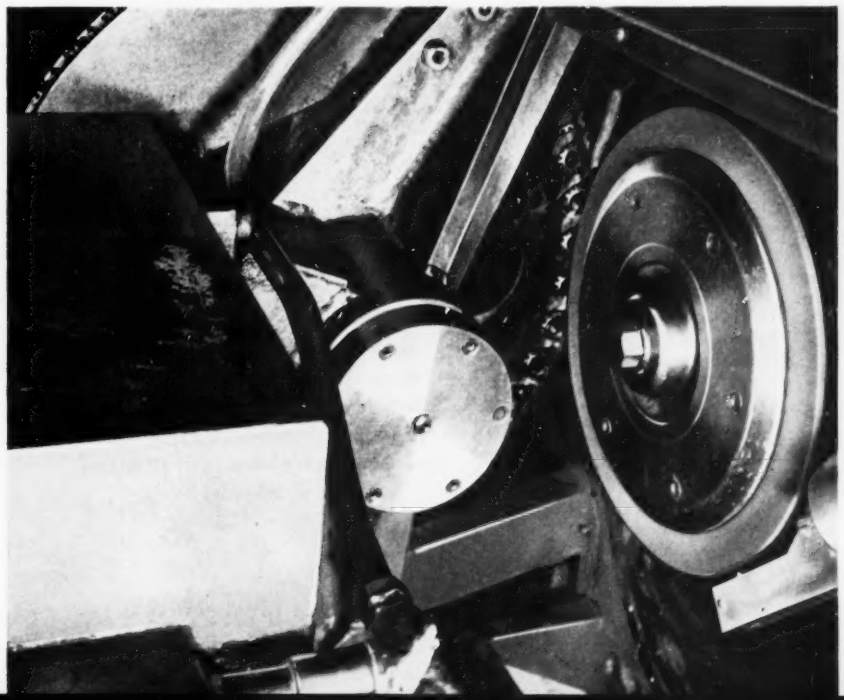


Fig. 3. Close-up view of groove-grinding machine. The pinions were carried between abrasive wheels 16 inches in diameter.

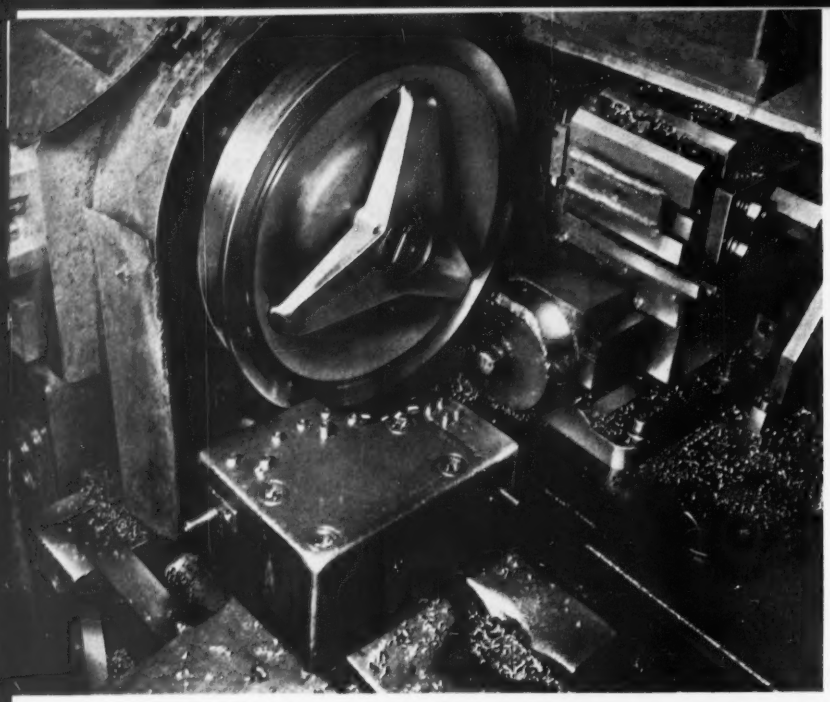


Fig. 4. One of the automatic lathes that was used to turn, face, and bore stamped flywheels. Cutting speeds varied up to 700 feet per minute.

On one particular group of automatic lathes —employed to face the crankshaft mounting surfaces of the flywheels at a cutting speed of 700 feet per minute—the machining area was completely enclosed with 1/4-inch thick steel plate. Latched doors provided access for loading and unloading the work. In the set-up illustrated, the periphery of the stamped flywheel was turned, and the cover mating surface was semi-finish-faced. From 0.015 to 0.045 inch of stock was removed from these surfaces, with the work rotating at 500 surface feet per minute and the tools fed at the rate of 0.020 inch per revolution. Single-point, carbide-tipped tools and triangular-shaped carbide inserts were employed for all turning, facing, and boring operations on the flywheel. A maximum surface roughness of 100 micro-inches r.m.s. was maintained on the crankshaft mounting face.

The peripheries of the stamped flywheels were hobbed to provide each part with 145 teeth of 10/12 diametral pitch, having a pitch diameter of 14.500 inches. The teeth were flame-hardened on a four-station indexing machine, Fig. 5, designed and built by Detroit Transmission. Flywheels were loaded and unloaded at the first station of the flame-hardening machine, and at the second station (seen at the right), the teeth were preheated to a temperature of 900 degrees F. At the third station, shown at the left, the teeth were heated to the required temperature of 1550 degrees F., and the flywheels were

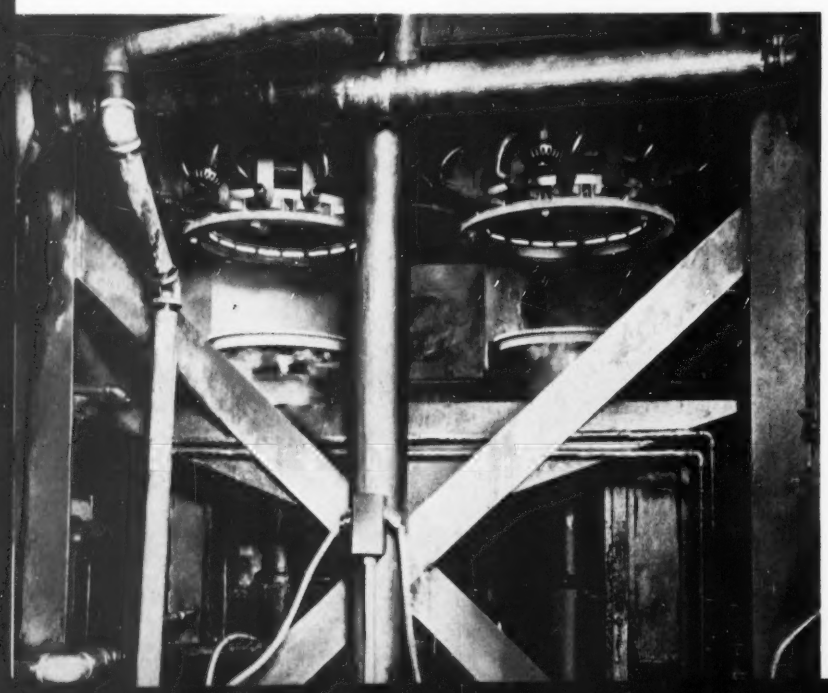


Fig. 5. Second and third stations of the four-station indexing machine for flame-hardening teeth on the periphery of stamped flywheels.

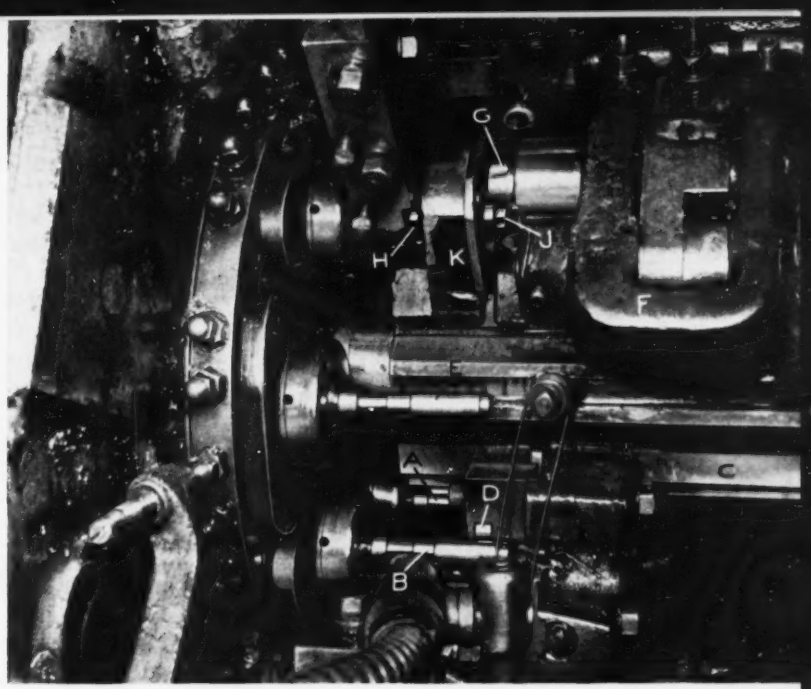


Fig. 6. Close-up view of tooling area on a six-spindle automatic that produced brake-band stop-screws. Square end was milled on round bar stock by cutter (G)

quenched at the fourth and final station of this special machine.

In loading, the operator placed the flywheel on a fixture. When the fixture and work-piece had been indexed to the second, or preheating, station, a vertical spindle rotating at 21 R.P.M. picked up the loaded fixture and lifted it into the burner ring shown at the upper right. The burner rings for both the preheating and final heating operations each contained eighteen Selas rectangular-shaped nozzles that burned natural gas mixed with air in the proportion of 9 to 1, by volume.

After the flywheel had been rotated for twenty seconds within the burner ring, the spindle was automatically lowered and disengaged from the fixture. The fixture and flywheel were then indexed to the third (final heating) station, where another vertical spindle rotating at the same speed lifted them into the burner ring shown at the upper left. When the spindle was lowered and disengaged after another twenty-second cycle, the loaded fixture was automatically indexed to the fourth station and lowered into the oil-quench tank. After eighteen seconds, the hardened flywheel was raised and indexed to the unloading station.

With this treatment, the teeth attained a Rockwell C hardness of from 43 to 50, to a point 1/16 inch below the periphery of the flywheel; from 30 to 48 in that area from 1/16 to 1/8 inch below the outside diameter; and from 15 to 35 at

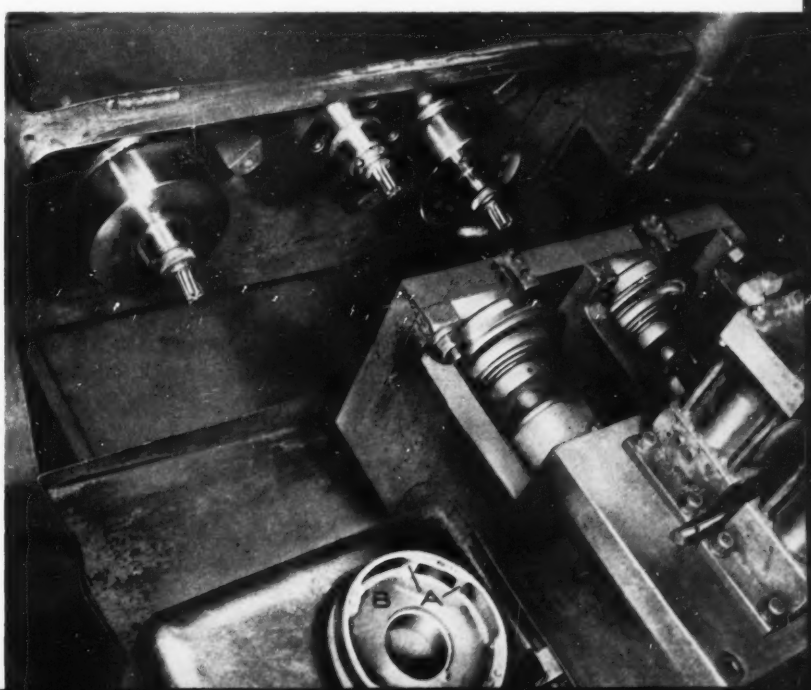


Fig. 7. A six-spindle, double-end machine equipped with four work-holding fixtures that was employed to mill surfaces (A) in cast-iron pump covers

1/8 to 3/16 inch below. One flywheel was completed every twenty seconds, resulting in a production of 180 per hour. Gas consumption averaged 3000 cubic feet per hour for final heating.

Milling Square Ends on Automatic Screw Machines

Adjustable stop-screws for the brake-bands of the Hydra-Matic transmission were produced on an Acme-Gridley six-spindle automatic at the rate of 189 per hour. An unusual feature of this set-up was that a 5/16-inch square end was produced on one end of the round bar stock by means of a special milling attachment.

At the sixth station on the automatic, *A* in Fig. 6, the cold-drawn, S A E 1137 steel, round bar stock was rough-formed by means of a circular form tool mounted on the lower rear cross-slide. The stop-screw was finish-formed and turned at the first station *B* with a dovetailed form tool mounted on the lower front cross-slide, and an end-forming tool held on the main tool-slide *C*. Rollers *D*, which were mounted in a block secured to the main slide, supported the bar stock while these operations were being performed. The second station *E* was idle.

A special milling head *F* was mounted on the main slide at the third station. The head was equipped with a two-blade fly cutter *G* that rotated at 1440 R.P.M.—twice as fast as the work-piece *H*. Thus, one flat surface of the 3/16-inch long, 5/16-inch square end was cut with each blade of the cutter per revolution, and the square end *J* was generated on the brake-band stop-screw. During this operation, the work-piece was supported by a bushing block *K* that was mounted on the main slide of the machine and pushed onto the work as the slide was advanced.

At the fourth station on the machine, 1/2–20 threads were chased on the largest diameter of the part. The completed stop-screws were cut off from the bar stock at the fifth station. A cutting speed of 95 feet per minute (720 R.P.M) was employed, and the tool-slides were fed at the rate of 0.0012 inch per revolution.

Milling of Cast-Iron Front Pump Covers

Cast-iron front pump covers for the Hydra-Matic transmission are a particularly difficult part to machine because flat, smooth surfaces must be accurately produced to insure an oil-tight, metal-to-metal seal with a sliding member in subsequent assembly. The two surfaces indicated at *A* on the front pump cover in Fig. 7 (and two similar surfaces diametrically opposite) must be milled parallel to each other, and flush and at right angles with the previously faced inner surface *B* within plus or minus 0.0005 inch. Also, fillets having a radius not smaller than 0.008 inch nor larger than 0.015 inch, must be maintained where surfaces *A* join surface *B*.

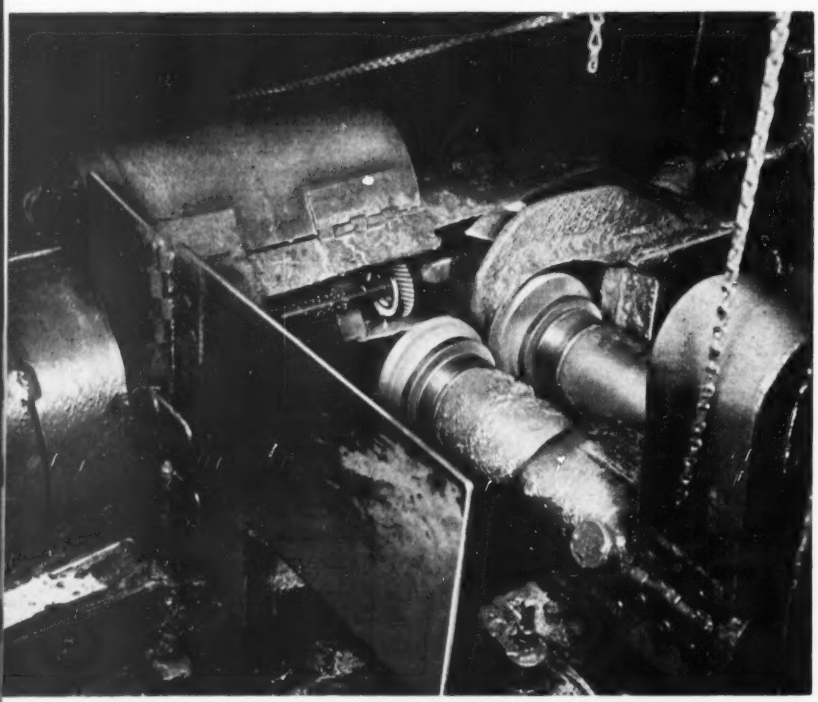
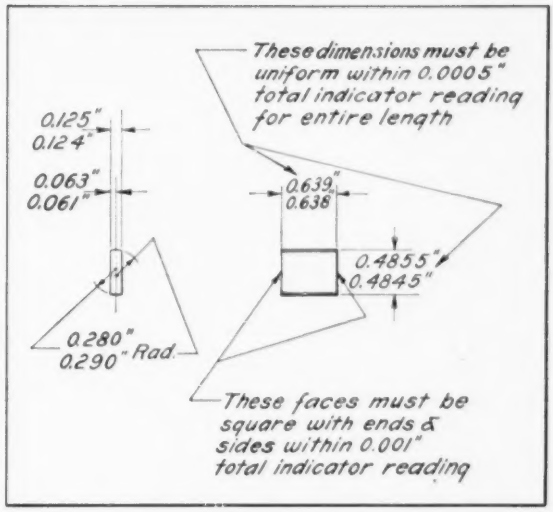


Fig. 8. Special machine that was used to rough- and finish-grind both faces of a gear forged as an integral part of the transmission main shaft

Fig. 9. Vane for the front pump of Hydra-Matic transmission. Rounded edges of the vanes were ground on the special machine shown in Fig. 10.



This difficult operation was performed on the Ex-Cell-O six-spindle, double-end machine shown in Fig. 7. Two hydraulically operated fixtures at one end of the machine were unloaded and reloaded while two castings, in the fixtures at the other end of the machine, were being milled. The pump covers were located in the fixtures radially from two previously reamed dowel holes, and against the previously faced surface *B*. The castings were clamped on their back surfaces by cams actuated by vertical hydraulic pistons.

The three spindles on each end of the machine were equipped with carbide-tipped, six-flute end-mills, 0.750 inch in diameter. In resharpening, the mills were kept in sets and 0.010 inch of stock was removed. A set of cutters could be employed until the diameter was reduced to 0.700 inch. The cutters had to be accurately set for the depth to be milled to insure good blending of the surfaces, and the spindles were mounted in a cradle to permit adjusting the center distances after the cutters had been sharpened.

As the cast pump covers were fed toward the cutters, the left-hand cutter seen in Fig. 7 milled the two lower flats on one part, and the center cutter milled the two upper flats on the other part. Then, the work-carrier automatically fed away from the cutters, indexed to the right, and fed back again to the cutters. In this part of the cycle, the center cutter milled the two upper flats on the first casting, and the right-hand mill machined the two lower flats on the second workpiece. This cycle was then repeated on two more parts at the other end of the machine.

As much as 0.060 inch of stock was removed from each of the four surfaces in the front pump covers. The end-mills were rotated at 2000 R.P.M., and the work-pieces were fed at the rate of 12 inches per minute. Slightly less than one minute was required to complete the cycle on two parts at each end of the machine, resulting in a production of 110 castings per hour.

Double-Wheel Grinder for Main Shaft Gear

Both faces of the integral gear forged on the transmission main shaft were ground simultaneously on the special Heald double-spindle grinding machine shown in Fig. 8. The forged S A E 5140 steel shafts were held between centers, and the two grinding spindles were set at right angles to the axis of the work. In this way, the gear faces were ground with the peripheries of the two abrasive wheels. These surfaces were ground parallel and square with the axis of the main shaft within 0.001-inch total indicator reading. A maximum surface roughness of 35 micro-inches r.m.s. is specified.

Rough- and finish-grinding of the gear faces was accomplished automatically in the one set-up, with the abrasive wheels being diamond dressed between passes. The wheels were automatically brought together the required amount after each pass, to compensate for the abrasive removed in dressing. Both faces were rough- and finish-ground in about forty-five seconds, resulting in a gross production of eighty shafts per hour.

Special Machine for Rounding Edges of Pump Vanes

Vanes for the front pump of the Hydra-Matic transmission were blanked from S A E 1095, cold-drawn steel strip stock, heat-treated to obtain a hardness of 55 to 60 Rockwell C, and ground all over to the dimensions shown in Fig. 9. Because of their size, shape, and close tolerances, these vanes imposed handling, clamping, and machining problems.

Sides of the pump vanes were ground to the required 0.1245-inch thickness, and their end surfaces were ground to the 0.6385-inch length on double-end disc grinding machines. The rounded edges of the vanes were ground to the desired 0.285-inch radius and 0.4850-inch width on a special machine designed and built by Detroit Transmission to avoid chatter marks and hold the required parallelism and size.

The pump vanes were loaded at random into a hopper that aligned and fed them down a chute leading to a pair of rubber feed rolls. These rolls

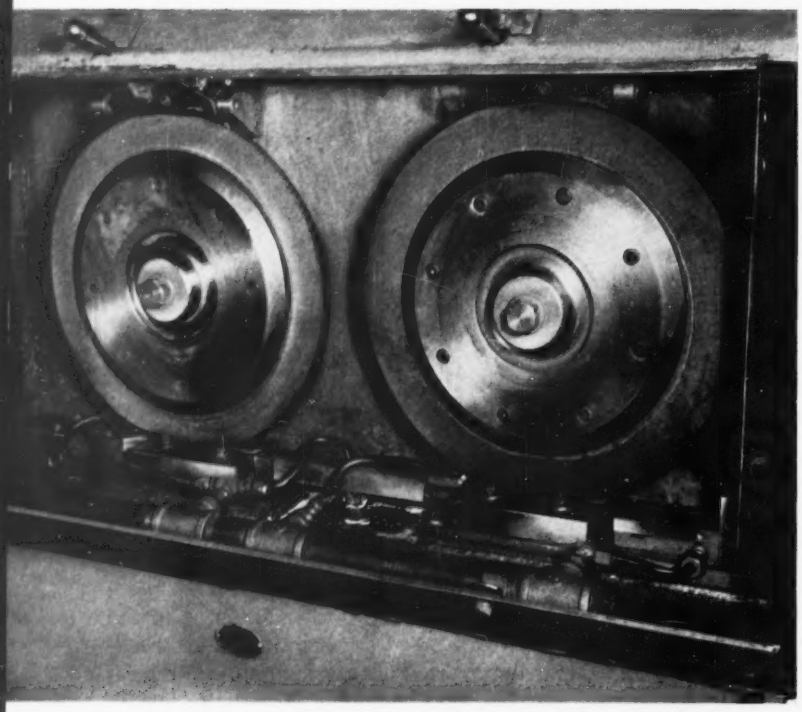


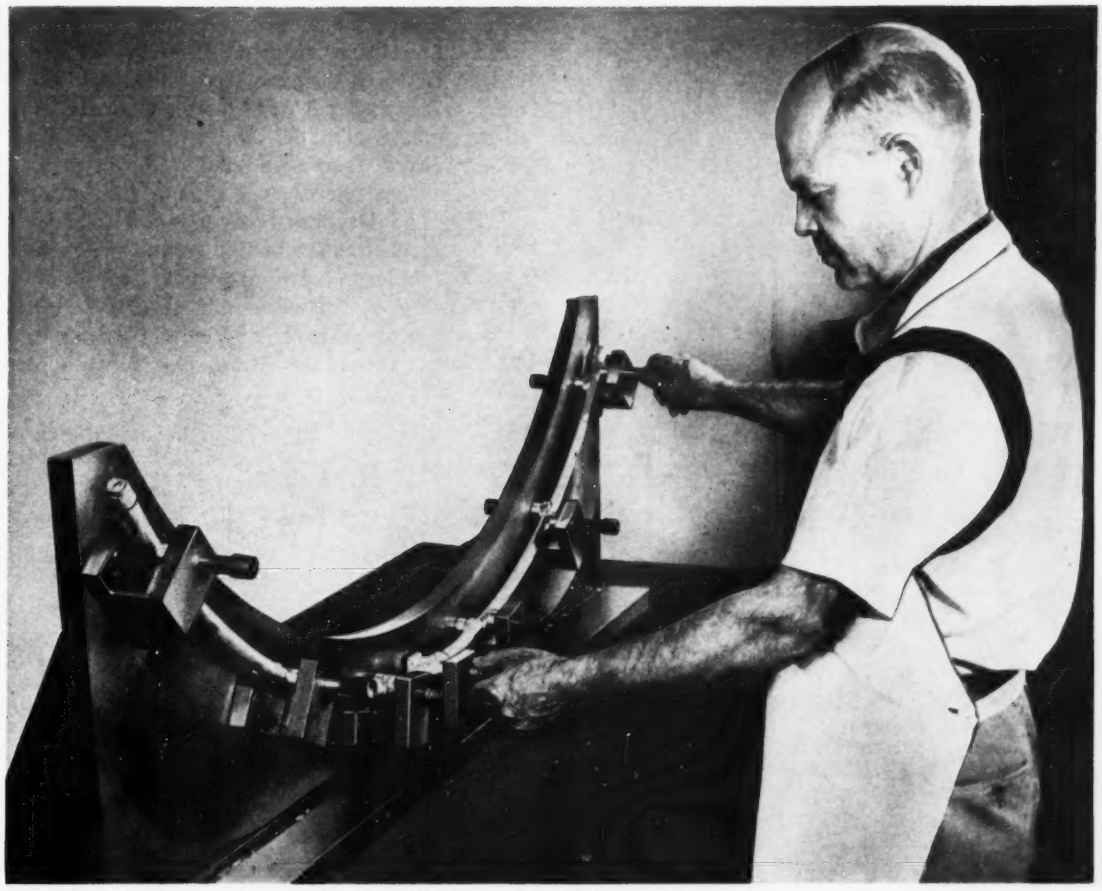
Fig. 10. Pump vanes passed under abrasive wheel seen at right, were turned over, and then were passed under wheel at left, to grind their rounded edges.

fed the vanes under the grinding wheel shown at the right in Fig. 10, with the vanes being guided by a carbide-lined trough that was constantly flushed with coolant to prevent the work-pieces from sticking.

After passing under this first wheel, during which one edge of each vane was ground to the required radius, the vanes passed through a twisted chute that turned them over, and under the grinding wheel shown at the left. Both abrasive wheels were rounded to the required radius by diamond dressing attachments shown pivoted above the wheels. From 0.0007 to 0.0017 inch of stock was removed from each edge, and a production of 3000 blades per hour was possible. Resinoid-bond, aluminum-oxide abrasive wheels, 16 inches in diameter by 1/4 inch thick, of 100 grain size were employed for this operation.



Convair's San Diego Division is saving more than $4500 annually by using this new tool for finishing aircraft parts. A small circular piece of emery paper is held firmly against the part by the motion of a tool fitted with a cylindrical piece of rubber. Finishing work was formerly done by hand-polishing small parts with emery paper wrapped around a block of wood. The new method saves 3000 hours annually, produces higher quality finishes, and enables operators to reach difficult spots.



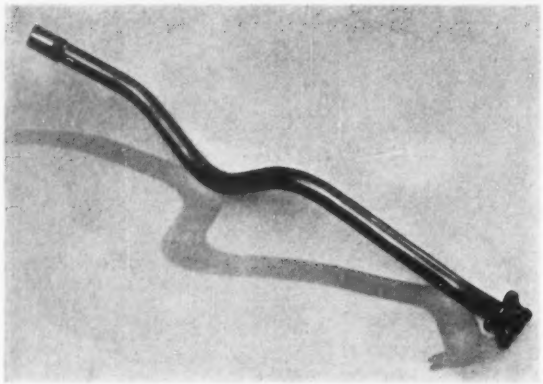
Producing Tubing Assemblies for Airplane Engines

OIL lines, fuel lines, and exhaust lines for modern airplane engines are precision assemblies of seamless steel tubing and forged fittings. Each of the engine models, reciprocating or jet, requires its own tubing systems. Tubes must be bent at exact points and to radii that conform to the configuration of the engine. Fittings must be machined to low microinch finish, then carefully brazed to the tubes. A typical assembly, a return oil line, is shown in Fig. 1.

Several leading engine manufacturers are relegating the rather ticklish problems involved in fabricating these assemblies to the Special Machine Tool Engineering Works, New York City. This company has the facilities and personnel to produce and test the complete product. Various steps in production are here highlighted.

In Fig. 2, a bent tube is cut to an accurate length on a Cincinnati horizontal milling machine. Subsequently, two such tubes are joined together to form part of a fuel line. A two-position indexing fixture permits both ends of the tube to be cut without disturbing the work. Dowel-pins lock the upper and the lower fixture plates during the cutting, which is performed in a plane perpendicular to the center line of the bent tube. Relatively light pressures are encountered, so the hole type cutter works satisfactorily on a short arbor without over-arm support. The carbon steel tube is machined at a speed of 200 surface feet per minute and a feed of 4 inches per minute.

Some tubes, in addition to being bent and milled to length, are flattened so that they will have clearance with other parts of the aircraft



engine. This operation is shown being performed on oil-drain tubes in Fig. 3. With the work gripped in the flattening fixture shown in the vise, the position and width of the squeezed area are carefully controlled.

As received from the steel mill, the tubing diameter has a tolerance of plus or minus 0.005 inch. Since a tolerance of only plus or minus 0.001 inch is specified at the brazed joints, the ends of the tubes undergo a swaging operation, as illustrated in Fig. 4. This close-up view of a Torrington swaging machine shows a small tube in work. The tube is thrust between a pair of split dies

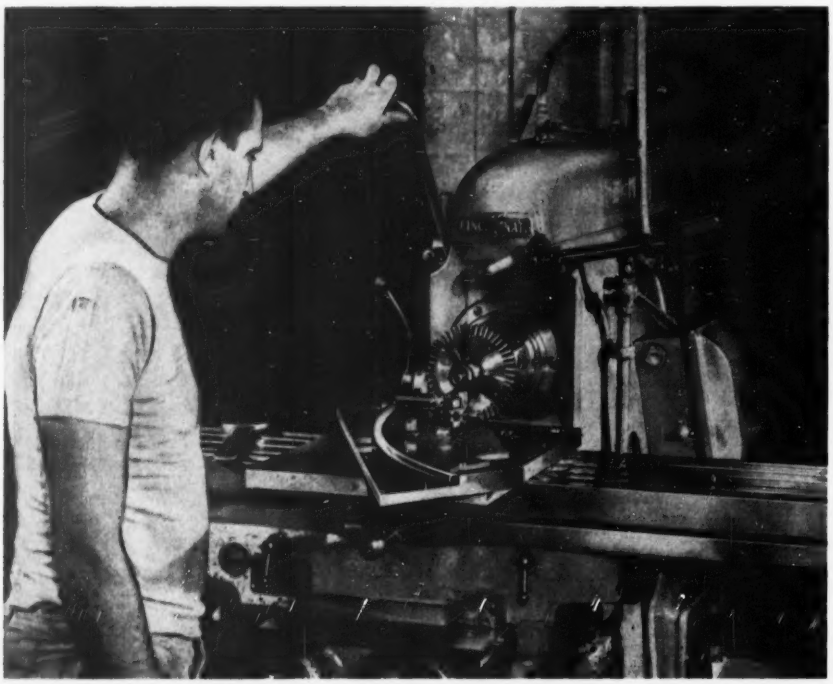


Fig. 1. (Top) This typical return oil line is a precision assembly of a bent tube, a threaded ferrule, and a connector flange.

Fig. 2. (Center) The two-position fixture permits both ends of the tube to be milled without disturbing the work.

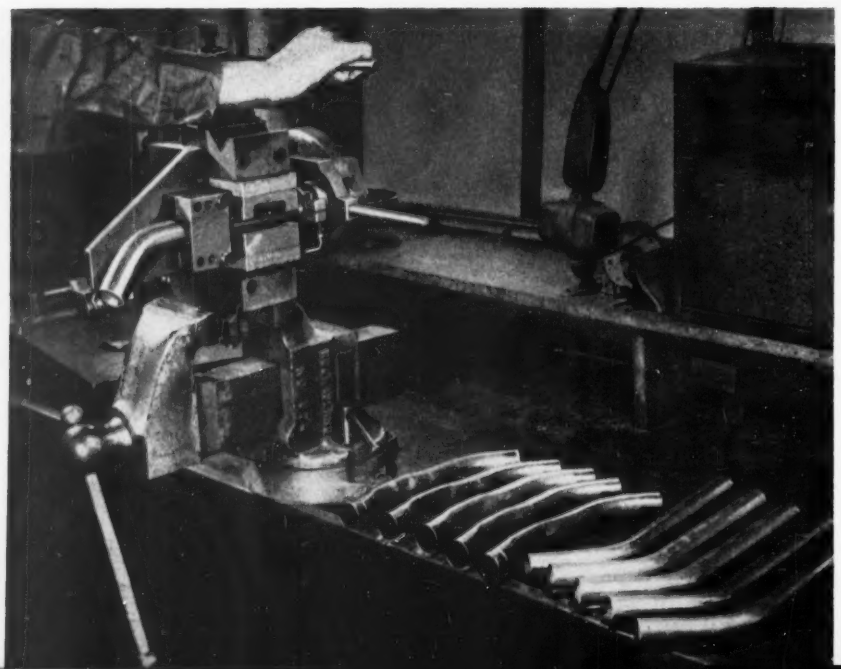
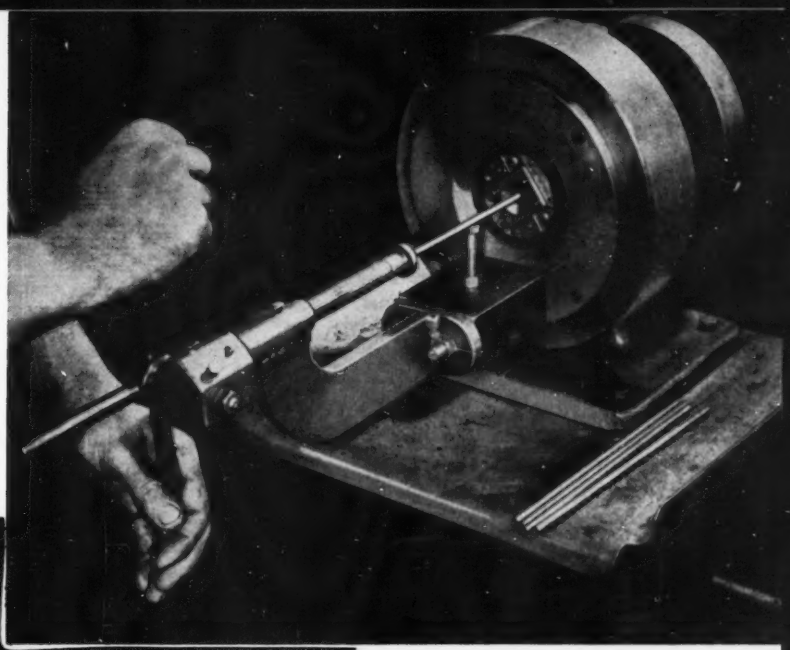


Fig. 3. (Bottom) Sometimes tubes have to be flattened as well as bent, in order to clear engine obstructions.

Fig. 4. Swaging reduces the outside diameter at the ends of the tube to within the small tolerance specified.



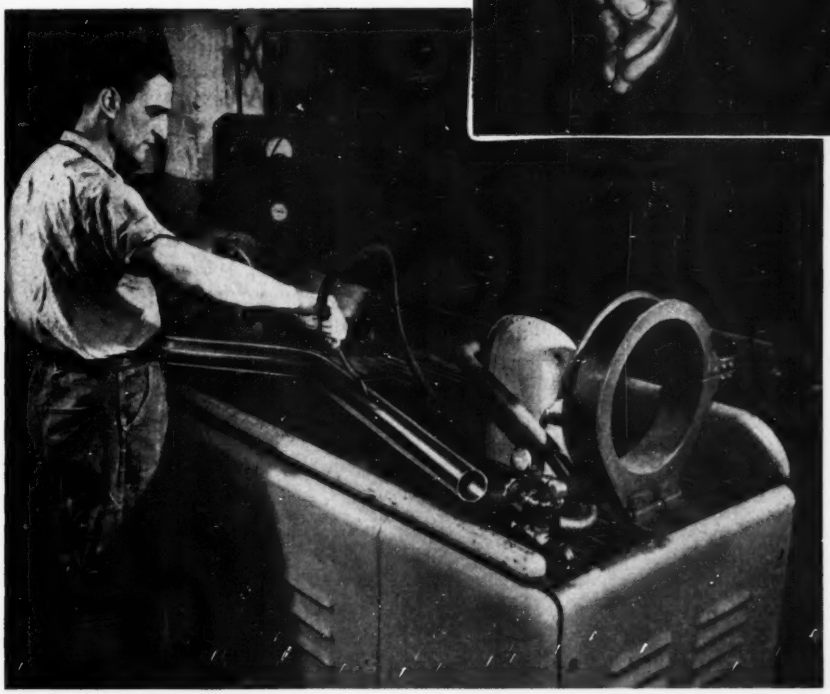


Fig. 5. A continuous wet method is employed in subjecting the bent tubes to the Magnaflux test seen at the left.

Fig. 6. In the machining cycle, facing and boring the exhaust pipe connector are performed simultaneously.

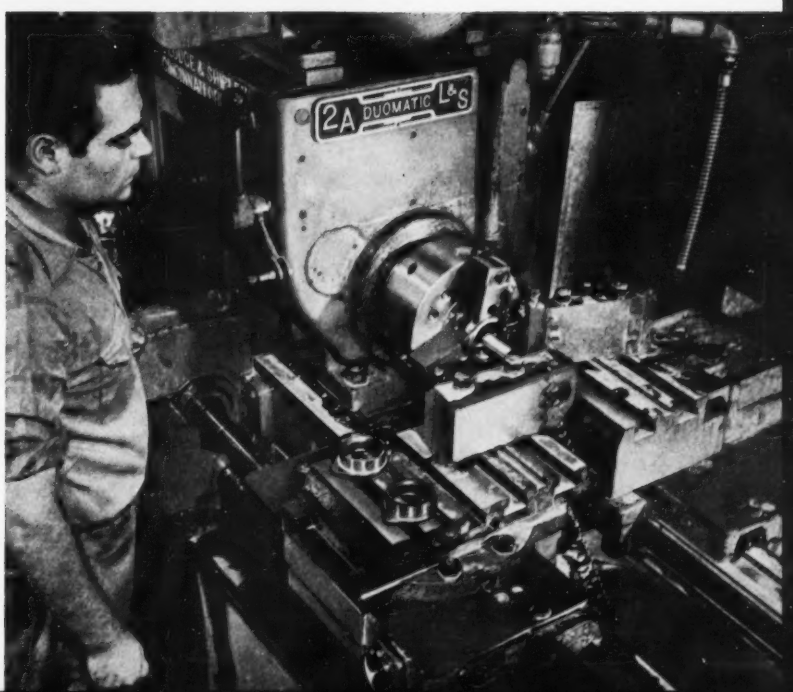




Fig. 7. This machine automatically presents standard tools to the work in rapid sequence for machining of trigger housing fittings.

held in a spindle revolving at a fairly high speed. Centrifugal force throws the dies out radially.

Each die, however, is backed up by a hammer that intercepts a series of stationary rolls fixed around the spindle. These rolls are equally spaced and are even in number, causing both hammers to deliver staccato blows in unison against the dies. Thus, the dies continuously open and close as the spindle revolves. In their closed position, the dies are slightly smaller in diameter than that of the tube. The swaging action, in reducing the outside diameter of the tube slightly to meet the specified tolerance, also improves the quality and surface finish of the material.

Discontinuities, differences in density, and flaws in the metal are rapidly detected by a 100 per cent Magnaflux inspection of the bent tubes, as seen in Fig. 5. In this process, the test piece is magnetized. Any break in the material causes the magnetic field to be concentrated at the defect through leakage. A fluid medium in which ferromagnetic particles are held in suspension is poured over the tube. Should a leakage field be present, the particles are attracted, and form a pattern that remains after the fluid drains off.

Forgings for fittings are machined on automatic equipment such as the Lodge & Shipley Duomatic lathe, Fig. 6. Here, a stainless-steel connector for an exhaust line assembly is simultaneously bored and faced from the front and rear carriages. Since the machining cycles are set by adjusting stops rather than by changing cams, this type of machine is ideal where many different fittings have to be produced in moderate quantities. For the operation illustrated, a Stellite tool is used for boring, and a high-speed steel tool for facing. A speed of 100 surface feet per minute is employed. The work is gripped on its finished outside diameter in a Logan air chuck equipped with soft jaws.

Small alloy-steel forgings for trigger housing fittings undergo a series of operations on the Warner & Swasey automatic chucking machine shown in Fig. 7. In this set-up, three steps are drilled and the work is faced. A spindle speed of 465 R.P.M. is maintained, with feed rates ranging between 0.0029 and 0.005 inch per spindle revolution. In a subsequent set-up on the same machine, the bore is recessed and tapped.

Brazing of fittings to tubes is performed either by torch or by induction heating. X-rays of the



Fig. 8. Induction brazing takes from four to ninety seconds, depending on the area of the joint.

Fig. 9. Since an insignificant amount of oxides forms in the argon atmosphere around the weld, no flux is needed.

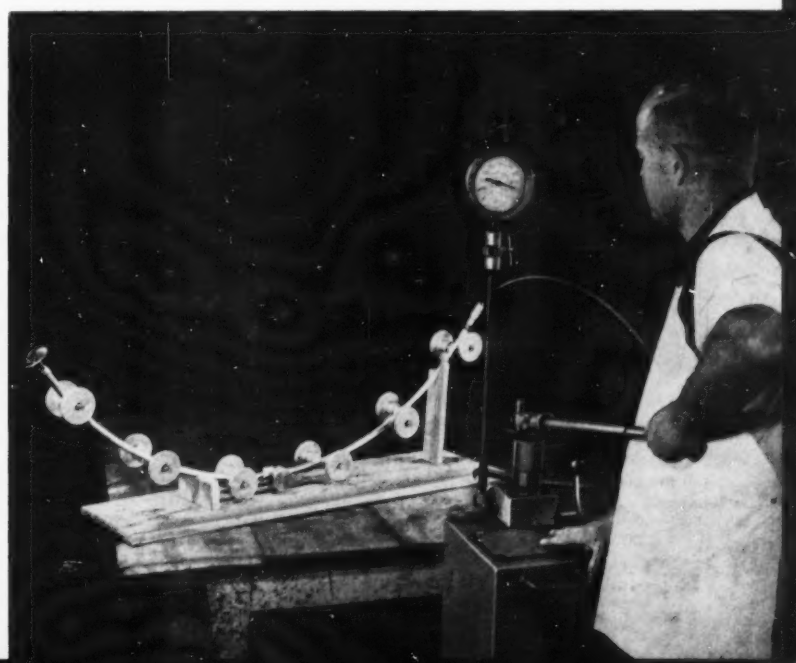


joint must show an 80 per cent coverage of the parent metal by the silver solder. This is a rigid requirement that cannot be met without the tight restrictions on clearance between the joint and the tube. In Fig. 8, the operator is shown induction brazing a threaded ferrule to a supercharger sump oil line on a Lepel high-frequency converter. A formed ring of silver solder has already been slipped over the joint.

Complicated fittings are sometimes made of two parts that are subsequently butt-welded together. An inert-gas metal-arc weld being made on such a fitting is shown in Fig. 9. To position the work, it is slipped on a mandrel which is held between centers. An atmosphere of argon gas shields the tungsten electrode used in the process. Direct current, flowing in positive polarity, is supplied by a generator.

In a hydrostatic test, Fig. 10, the completed assembly must withstand a pressure of 1800 pounds per square inch for a three-minute period. Then, the configuration, location of fittings, and over-all length of the assembly are checked in an acceptance gage, seen in the heading illustration.

Fig. 10. All assemblies are pressure-tested, either by fluid or by air, to pass rigid government specifications.



How Form Tolerances Affect Gaging Requirements

Part III

Tolerances are established to control variations in size, form, position, and function. In this seventh of a series of articles on dimensions and tolerances for mass production, the author shows how tolerances on form—particularly tapers—are selected and how they determine the gaging requirements

By EARLE BUCKINGHAM
Professor of Mechanical Engineering
Massachusetts Institute of Technology

THE application of tolerances to the dimensions that define a tapered surface introduces many problems. The surface in itself comprises factors of size, form, and position. A satisfactory solution must be simple, definite, and unambiguous in every respect. If all sizes were fixed and if variations were not inevitable, any one of several possible solutions would be adequate. But a tolerance on a condition of size must not affect a condition of form which may be of the greater importance. Again, a tolerance on a condition of form must not conflict with some condition of position which may, at times, be of the greater importance. Each condition must be controlled, with tolerances, independently of the others. Here as elsewhere, the functional requirements must be expressed definitely and unmistakably, without any redundant tolerances. Present practice, in general, is often indeterminate. This problem and its solution can best be understood by the consideration of definite examples where the functional requirements of size, form, and position are of varying degrees of importance.

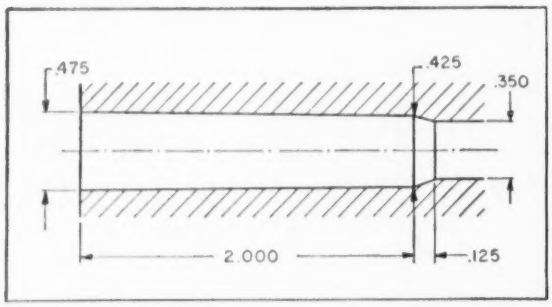


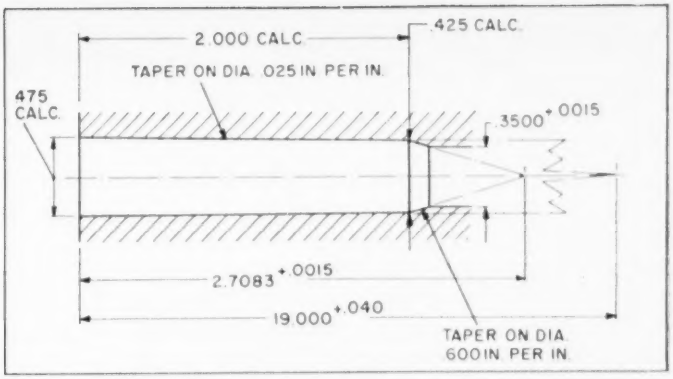
Fig. 1. This rifle chamber consists of two intersecting tapered surfaces with a cylindrical surface at the end of the chamber. The dimensions shown define the size, form, and position of the elements of the chamber as well as the design size of this feature.

Chamber of a Rifle

The first example is that of a chamber of a rifle. This feature consists of two intersecting tapered surfaces with a cylindrical surface at the end of the chamber, as seen in Fig. 1. The dimensions as shown, without tolerances, accurately define the size, form, and position of the several elements of this composite form. They also give the design size of this feature. Tolerances applied directly to any one or more of these dimensions will disturb the form and positions of the several elements of the chamber, and cannot be made to express the functional requirements of the several elements.

Functional Requirements—These are substantially as follows: The tapered shoulder at the small end of the long taper must fit tightly against the corresponding shoulder on the cartridge case in order to prevent the escape of gases when the cartridge is exploded. This condition requires the use of a small tolerance for the position of this shoulder—possibly 0.0015 inch. The total variation in the distance between the face of the bolt of the rifle and this shoulder in the chamber when the bolt is locked in its firing position is about 0.005 inch. At least three conditions of position are involved here: the distance from the locking lug to the face of the bolt, the distance of the breech face of the barrel from the locking surface of the receiver, and the distance of the breech face of the barrel from the tapered shoulder of the chamber.

Fig. 2. Tolerances on the tapered surfaces of the rifle chamber in Fig. 1 must be so expressed that the functional requirements of the chamber are met.



The main body of the cartridge case must fit freely into the larger and longer tapered recess of the chamber. The diameter of this recess can be a little larger than the design size—but it must not be so large that when the cartridge case has been expanded by the pressure of the exploded powder charge, the material of the cartridge case will be stressed beyond its elastic limit because of the amount of expansion permitted by the size of the chamber. If this should happen, the cartridge case will stick in the chamber, and often its head will be pulled off by the extractor. To meet this condition, the tolerance on the diameter of this part of the chamber must be restricted to about 0.001 inch.

In this instance, the diameter or size of the larger and longer tapered recess must be controlled within definite limits while the position of the tapered shoulder must be controlled within other limits. The position of the intersection of the two tapered surfaces, where the design diameter is 0.425 inch, is incidental and is given as a calculated dimension only to establish the design size, form, and position of the several elements of the chamber. Actually, there will also be a fillet, which is not shown in Fig. 1 or 2, at the intersection of the two tapered surfaces and a rounded corner at the intersection of the tapered shoulder with the cylindrical portion of the chamber.

Each of the two tapered surfaces has its own function to perform. Hence their sizes, forms, and positions must be specified independently of each other. The diameter and position of their intersection will come as they may, since this is merely a coincidence and has no functional significance.

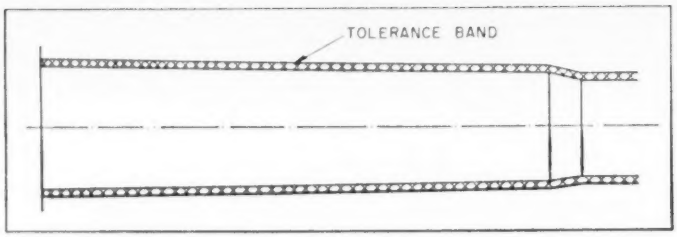
Methods of Specifying Tapers—The S A E Automotive Drafting Standards recommend, for dimensioning tapers with tolerances, the use of a fixed "gage diameter" with a "toleranced" dimension for its position and the amount of the taper. A tolerance is applied to the taper itself where necessary, either as the variation of the taper in inches per foot or inches per inch. This is a good practice for most tapered surfaces, but it may be confusing at times where intersecting tapers are involved. Another good practice is to dimension the position of the apex of the cone of the taper, with tolerances. In effect, this practice is the same as the S A E practice with the use of a gage diameter of zero.

The simplest, and probably the best way to accomplish the independent specification of each tapered surface is to locate the apex of each cone and to give a tolerance for each apex distance, as indicated in Fig. 2. The design sizes for the length and diameters at each end of the larger tapered surface are given as calculated sizes for reference. The angles of the cones are given as the taper on diameter per inch of length. This is a convenient method. The taper value given is equal to twice the tangent of one-half of the included angle of the cone. Another common method is to give the taper on diameter in inches per foot of length.

On the larger taper, with a ratio of 40 to 1 between the length and the increase in diameter, a tolerance of 0.001 inch in diameter is the same as displacing the apex of the cone axially a distance of 0.040 inch. The tolerance on the position of the apex of this taper is so expressed. The tolerance for the position of the tapered shoulder is given directly on the positional dimension to its apex because that is a direct expression of its functional requirement.

The tolerance band established by these dimensional specifications is shown in Fig. 3. This tolerance band extends over the entire outline of the chamber. The intersection of the two tapered surfaces with each other and the intersection of the tapered shoulder with the cylindrical portion of the chamber will come wherever they may meet. The positions of these intersections are of no importance in themselves. The tolerance band includes both variations in con-

Fig. 3. The tolerance band established by the dimensional specifications on the rifle chamber extends over the entire outline as shown.



ditions of size and variations in the forms of the tapers. If the form of the taper itself should be of more importance than its size or its position, then a further specification of the permissible variation in the taper itself must be given.

Gages for the Tapered Surfaces—The gages for these tapered surfaces of the chamber of the rifle are shown in Fig. 4. The gage for the long taper has a limit step at its large end. The lower step must be flush with or below the breech surface of the barrel while the top step must never be below this breech surface.

The tolerance on the tapered shoulder is so small that a close-fitting sleeve is provided to give an accurate registering surface for the limit steps on the stem of the taper gage. The outer face of this sleeve has a step with a height equal to the axial tolerance. The outside diameter of the taper portion of this gage is made slightly under size to clear the small fillet that will exist at the intersection of the two tapers. The shoulder on the stem of this taper gage must never be below the surface of the lower step on the sleeve nor above the surface of the upper step of the sleeve.

To measure such small tolerances, other designs are possible and often desirable. For instance, the end of the taper gage may be threaded, as on a micrometer spindle, and a graduated threaded collar or thimble may be used to measure the position of the tapered shoulder in the chamber. Again, a small dial indicator gage may be attached to the collar member to indicate the position of the tapered shoulder.

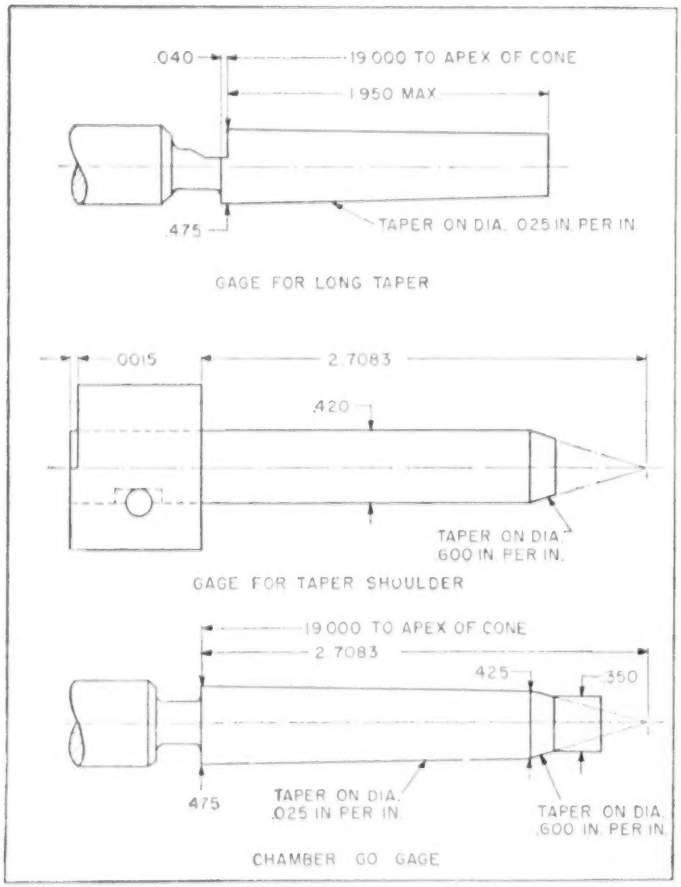


Fig. 4. Gages for the tapered surfaces of the chamber. The tolerance on the tapered shoulder is so small that a close-fitting sleeve is provided to give an accurate registering surface for the limit steps on the stem of the gage.

The GO gage for the complete chamber is of full maximum metal limit size, and also has the prescribed rounded corner at the intersection of the two tapered elements and a fillet at the intersection of the tapered shoulder with the cylindrical surface of the chamber. The end shoulder of this gage must be flush with or slightly below the breech surface of the barrel. If the feature of the component part being inspected is of full maximum metal size, then the form and concentricity of the several elements of the chamber must be perfect.

No. 5 Self-Holding Taper

The second example is a No. 5 Self-Holding Taper from the American Standard for Machine Tapers, ASA B5.10–1943. The dimensional specifications for the tapered shank and the tapered socket for this size of machine taper, as given in Table 2 of the standard, are shown in Fig. 5.

Analysis of Taper Specifications—In this example, a gage line has been selected at the end of the tapered socket, and the diameter of the taper with a tolerance, at this gage line, is used to establish the size and position of the taper. This is a poor practice. Either a fixed diameter at the gage line with a tolerance on its axial position or the axial position with a tolerance of the apex of the taper cone is more direct and clearer. The dimensional specifications must be translated into inspection gages. The tolerance is measured by the axial displacement of the taper gage so that the tolerance should show directly the amount of the axial displacement of the gage. The tolerance on the diameter of the taper at the gage line, as given in Fig. 5, requires a calculation to determine the equivalent axial displacement of the taper gage, and such calculations often lead to controversy, depending upon the number of decimal places used in making the calculations.

The taper on the diameter of this component is 0.63151 inch per foot of length. (This was originally a Morse taper where the nominal value for the taper was 0.625 inch per foot of length. Tapered shanks and sockets as actually manufactured were based on a master taper made many years ago without benefit of micrometers or vernier calipers. Such vast quantities of these tapered parts were in actual existence when the standard was developed under the procedure of the ASA that the actual taper of the original master taper had to be perpetuated.)

The ratio of the length to the increase in diameter of this particular size of machine taper is 12 to 0.63151, which is equal to 19.00207 to 1. A tolerance of 0.002 inch on the diameter of the taper at the gage line is equal to an axial displacement of the taper of 0.038 inch.

Analysis of Taper Gage Specifications—This standard also gives the specifications of the taper plug gage for the tapered socket and the taper ring gage for the tapered shank. These are shown in Fig. 6. A gage tolerance of plus 0.00015 inch is given on the diameter of the taper plug gage at the gage line, and a tolerance of minus 0.00015 inch is given for the diameter of the taper ring gage at its gage line. The taper plug gage has a step of 0.038 inch at the large end which corresponds to the socket diameter tolerance of 0.002 inch at the gage line. The taper ring gage is 5 3/16 inches long with no steps or any other means of determining the limiting sizes of the tapered shank. No tolerances are given for errors in taper.

The accuracy of the form of this taper is much more important than its accuracy of size, yet nothing in the specifications gives any indication of this important factor. The assumption probably is that everyone who uses the standard already knows this. In any case of question about the accuracy of the taper, it is also probably assumed that one of the parts will be blued, tried

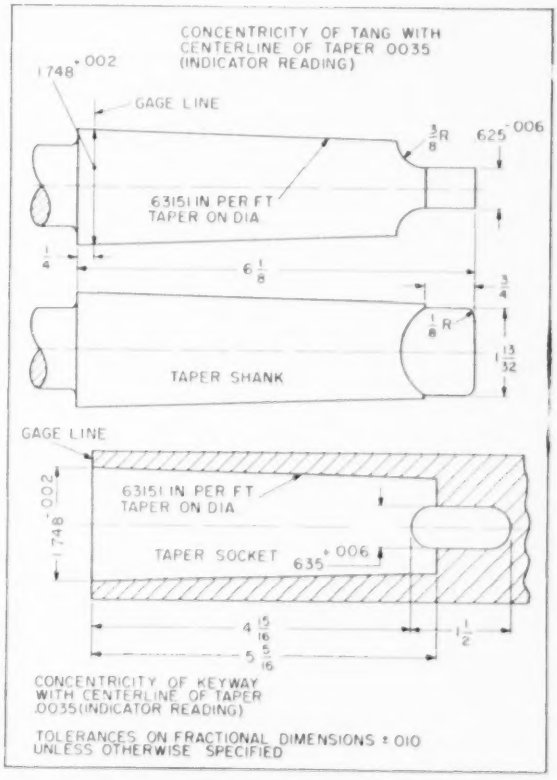


Fig. 5. The dimensional specifications for this No. 5 Self-Holding Taper are given in Table 2 of American Standard Machine Tapers.

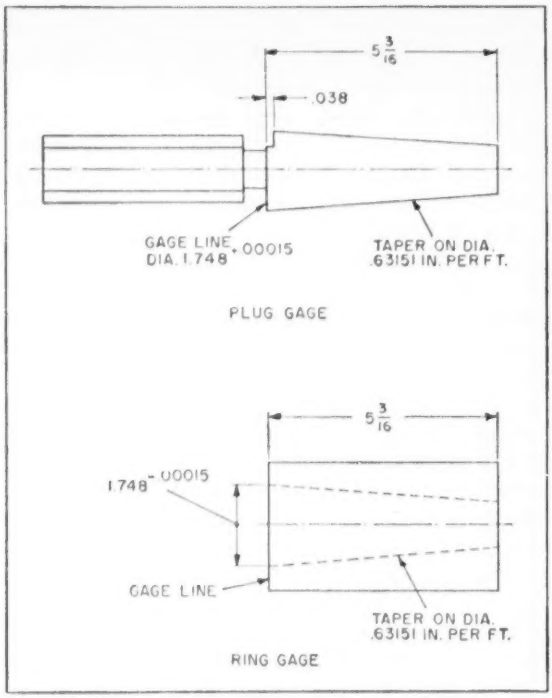


Fig. 6. Specifications of the taper plug gage and the taper ring gage for the No. 5 taper shown in Fig. 5.

in the gage, and the markings noted for completeness of contact. This would be carrying out a practice that has been followed for the last two generations. In this respect, these specifications are indeterminate.

The gaging of the tapered recess in the socket is definite as far as conditions of size and position are concerned, and the product can be held to definite limits. This, however, is not true for the tapered shank. Only the basic size, or design size, is represented by the taper ring gage. The large end of the tapered part of the shank is exposed a nominal distance of 1/4 inch. The tolerance on the diameter of the tapered shank at its gage line of 0.002 inch will let the shank project a further distance of 0.038 inch.

The general tolerance of plus and minus 0.010 inch on fractional dimensions shown in Fig. 5 may or may not apply to the 5 3/16-inch dimension of the ring gage, in Fig. 6. If it does, the large end of the tapered shank should be between 0.298 and 0.240 inch beyond the end of the taper ring gage or gage line. Or does the specification mean that the large end of the tapered shank should be kept between 0.260 and 0.240 inch beyond the end of the taper ring gage? If this last is the intention, what is the import of the plus 0.002-inch tolerance on the diameter of the tapered shank at the gage line? Since specific gages are shown in the specifications which are supposed to define the physical limits of the product, why has no control been provided for them in the limit gage design? These specifications for the tapered shank as expressed by the gages are also indeterminate. The only apparent use for this taper ring gage is to act as a check gage for the taper plug gage employed for checking the socket. Perhaps that is the intent of this standard. It may be meant to apply only to the tapered socket.

Concentricity Specified in Error—The notes about concentricity of the tang and the keyway in relation to the tapered surface are also ambiguous. If they mean the difference in the indicator reading when the part is rotated one-half revolution, this difference represents the amount of run-out and the note should read: "Run-out of tang and keyway in relation to center line of taper . . ." If the notes are meant to specify eccentricity, which is the distance between the true axis of the tang and the keyway and that of the tapered surface, they should read: "Center line of tang and keyway to align with center line of taper within . . ." The term concentricity, although commonly used, is misleading. It is the lack of concentricity which is involved here, and this should be specified as either the amount of eccentricity or of run-out.

Considering the amount of the allowance be-

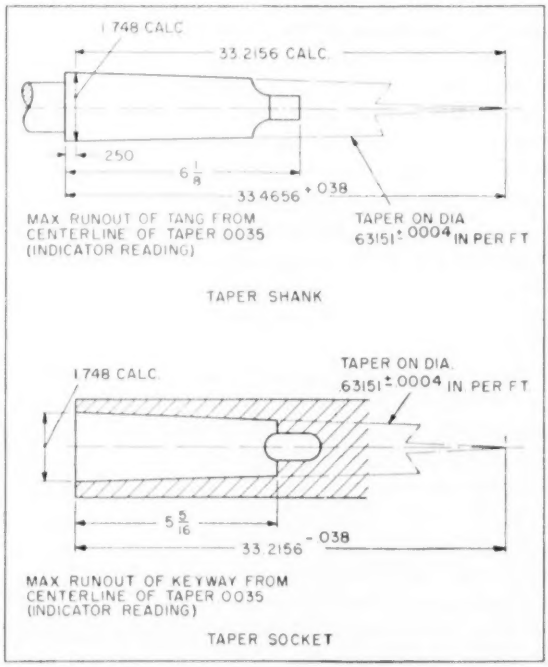


Fig. 7. More precise method of specifying the No. 5 taper. The taper is defined from its apex distance, and the tolerance on the size of the taper is controlled by the tolerance on the dimension to the apex.

tween the thickness of the tang and the width of the keyway, and also the note "Indicator Reading," it is most probable that the value specified refers to the run-out.

More Precise Specification for Taper—The use of a gage line of fixed diameter for a long taper is advantageous at times, but a tolerance added to the diameter at this gage line, together with other axial dimensions with tolerances given from this gage line, will always lead to questions and uncertainties unless definitely restricted by specific limit gages, which then form an integral part of the dimensional specifications of the product. On the other hand, when the size and position of the taper are defined by either the axial position of the gage line of fixed diameter or its apex distance, then it is possible to express specific dimensional conditions from which definite limit gages to check these requirements can be established.

A more precise specification of this machine taper, for both the shank and the socket, is shown in Fig. 7. Here the taper is defined from its apex distance. The tolerance on the size of the taper is controlled by the tolerance on the positional dimension to its apex. Calculated values are shown for the diameters at the original gage line for reference. There is no possibility here of redundant tolerances. In addition, a definite tolerance is given here for variations in the accuracy of the tapered surface, or form. The value of the tolerance shown in Fig. 7 may be too much or too little. The correct value for the tolerance can soon be established by conducting a few simple experiments.

Providing Gages to Check Form of Taper—The taper plug limit gage shown in the original specifications is adequate. The new and revised specifications result in gage specifications identical for the size and position of this tapered recess to those of the original specifications. But the new specifications give a definite limit to the permissible variations in the form of this tapered surface. This is accomplished by expressing a tolerance on the taper itself.

To test the accuracy of the socket taper, a double taper plug gage is used as shown in Fig. 8. This gage is calibrated in a master taper ring gage. The variation in the relative positions of the two narrow taper plug gages is the product of the amount of error in taper permitted (in inch per foot), the distance between the tops of the two narrow taper plug gages (in feet), and the ratio of the length to the increase in diameter of the taper. In this example it is equal to [0.0004 × (4.50÷12) × 19] which is equal to plus and

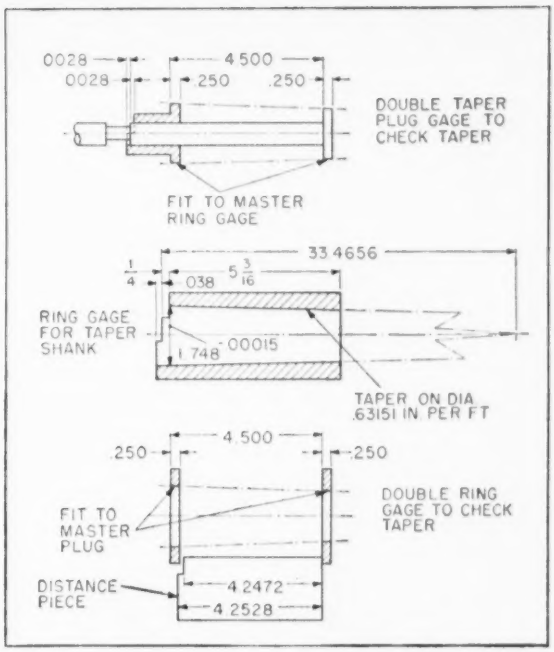
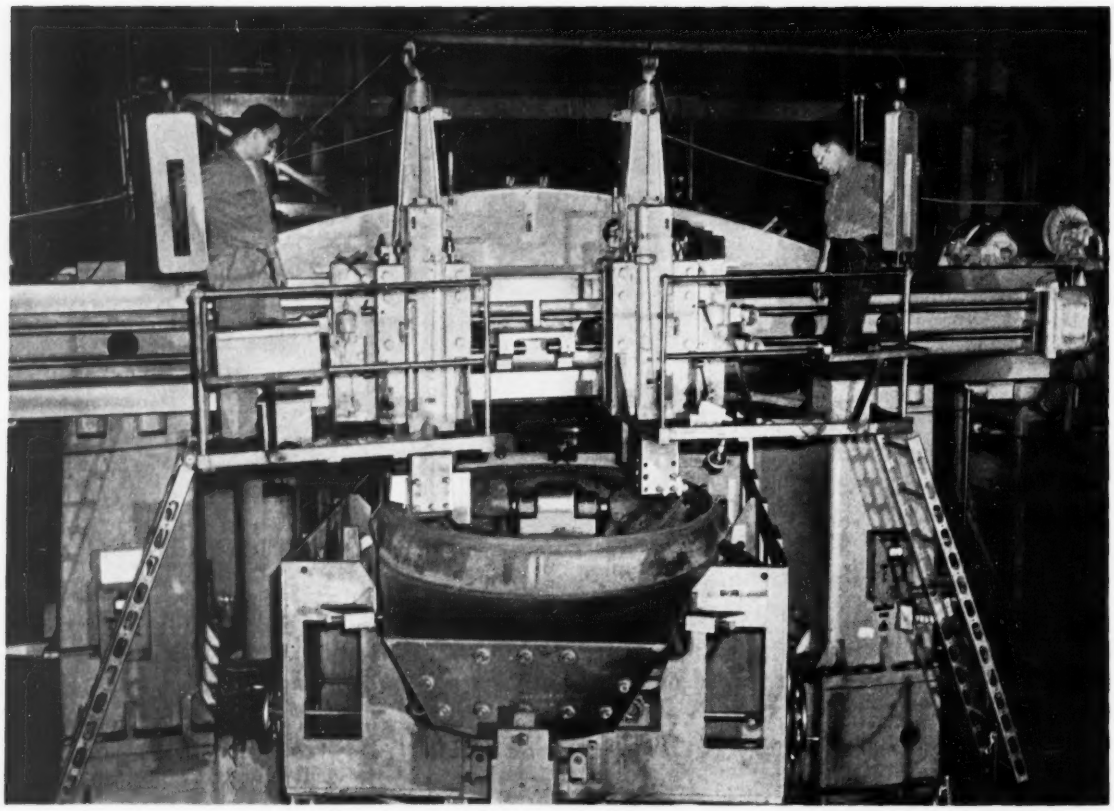


Fig. 8. These revised gages for checking the size and position of the tapered surfaces give the same result as the gages originally specified for the No. 5 taper. In addition, they provide a definite limit to the permissible variations in the form of the tapers.

minus 0.0028 inch. The two narrow taper plug gages are calibrated in a master taper ring gage, and the steps defining the limits are established from the calibrated position of the two taper plug gages in the master ring gage. A slight variation in the distance between the two taper plug gages in the master ring—say up to an amount equal to 1/16 inch—would have little effect on the accuracy of the taper measurement. This type of gage is of the nature of a comparator.

The taper ring gage for the shank is made with three steps at its large end. The first, or lowest, step is used to compare the size of this taper ring gage with that of the taper plug gage shown in Fig. 6 for the socket. The second and third steps on this ring gage check the size of the tapered shank, registering from the large end of the tapered surface of the shank.

The double ring gage for the tapered shank, also shown in Fig. 8, together with the limit distance piece, check the accuracy of the taper of the shank. The actual length of the distance piece is established from the measured distance between the rings when seated on the master taper plug gage. One distance is 0.0028 inch less than this measured distance, while the other is 0.0028 inch greater. With these specifications and gages, an exact control is maintained on the accuracy of these machine tapers.



Tank Turret Production Typifies Cadillac Machining Methods

By Edgar Altholz
Associate Editor

RIPPING its own path through the rugged Korean terrain, the Army's newest light tank acquitted itself nobly. This M41 tank, called the Walker Bulldog, was designed to probe enemy lines, neutralize moderate opposition, reconnoiter, and patrol. Since the tank weighs only 26 tons, it can be transported by air. Yet its armor plate is heavy enough to provide adequate crew protection.

The main armament of the tank is a new high-velocity 76-millimeter gun. A muzzle brake reduces the force of the recoil, and an evacuator mechanism permits the discharge of rounds without excessive accumulation of fumes in the turret. Supplementing the punch of the big gun are two machine guns, both caliber .30. One is mounted on a pivot; the other is fixed on the turret and aligned with the "76."

Speed in excess of forty miles per hour and the ability to turn in its own length are provided by a power package composed of an Ordnance-Continental air-cooled supercharged engine and an Allison torque-converter type cross-drive transmission. There is a four-man crew: the commander, gunner, and loader are stationed in the turret; and the driver in the hull.

Birthplace of the Walker Bulldog is the sprawling Cleveland Tank Plant, operated for Army Ordnance by the Cadillac Motor Car Division of the General Motors Corporation. It is here that steel plate is welded and machined into hulls, turrets, and gun mounts; here that the wheels,

sprockets, tracks, power units, armament, gunfire control instruments, as well as hundreds of other items shipped in by suppliers, are assembled to the tank. Highlights of a few machining operations on the turret, about which this article is primarily concerned, will reveal an ingenious use of machine tools and work-fixtures.

The turret structure of the tank consists of formed homogeneous plate and castings of armor steel. Although information on the analysis of this metal is restricted, the machining problems encountered are similar in many respects to those attendant to the machining of high-alloy stainless steel. Consequently, the machine tools, cutters, jigs, and fixtures used are massive and rigid, as will be seen from the illustrations.

The turret contains many intricate instruments necessary for the operation of the tank. Synchronization of the carefully calibrated sighting equipment and the "business" end of the gun is only as accurate as the machined mounting surfaces to which these instruments are attached. In several instances, there is a compound tolerance of only 0.002 inch—that is, a tolerance of 0.002 inch in a horizontal and vertical plane between machined surfaces or center lines.

Operations on the turret are located from the center line of the gun trunnion holes. In Fig. 1, the holes are shown being trued by a boring cut after welding of the turret has been completed. The machining equipment consists of two table type Giddings & Lewis horizontal boring heads arranged in a "T" with a standard floor plate to which is secured the work-holding and locating fixture. Two special insert type carbide cutters are mounted on a stepped boring-bar in each head. One cutter bores the hole to 2 7/16 inches in diameter, and the other produces a 3-inch diameter counterbore.

As a next step, shown in the heading illustration, the support surfaces for the ball race assembly between the turret and hull are bored, counterbored, and faced. Undulation and parallelism must be held to within a maximum variation of 0.005 inch so that the ball race assembly meets torque specifications of traverse and rotation tests.

A huge box fixture weighing 22,000 pounds holds the turret in an inverted position on a Betts 14-foot vertical boring mill. Ten carbide cutters supported from the two rail-heads of the machine simultaneously finish the various work surfaces. The average depth of cut is 3/16 inch. To locate the turret in the fixture, handwheels on the fixture are operated to advance movable stub arbors into the trunnion holes. A screw-jack mechanism levels the turret, after which knee clamps secure it in position against stops.

The carbide tooling permits a relatively high rotative speed of the heavily loaded table of the machine. For this reason, the fixture is accurately counterbalanced to compensate for the lack of symmetry in the shape of the turret.

Drilling a series of holes in the race support

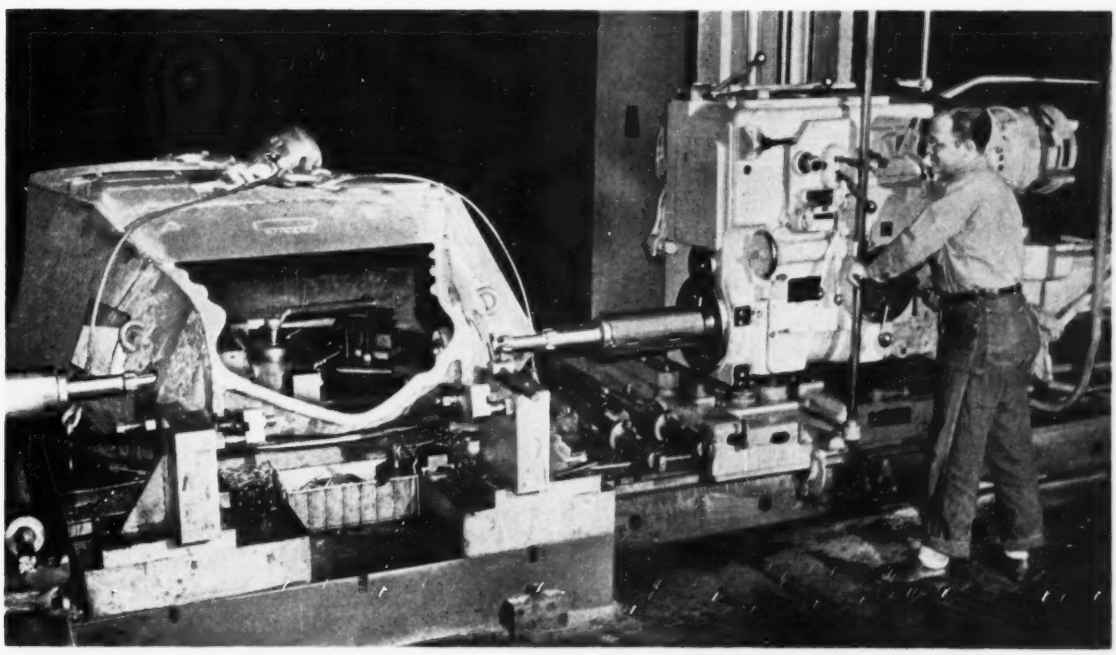


Fig. 1. Boring both trunnion pin holes simultaneously on two horizontal boring, drilling, and milling machines cuts "down" time, increases accuracy.

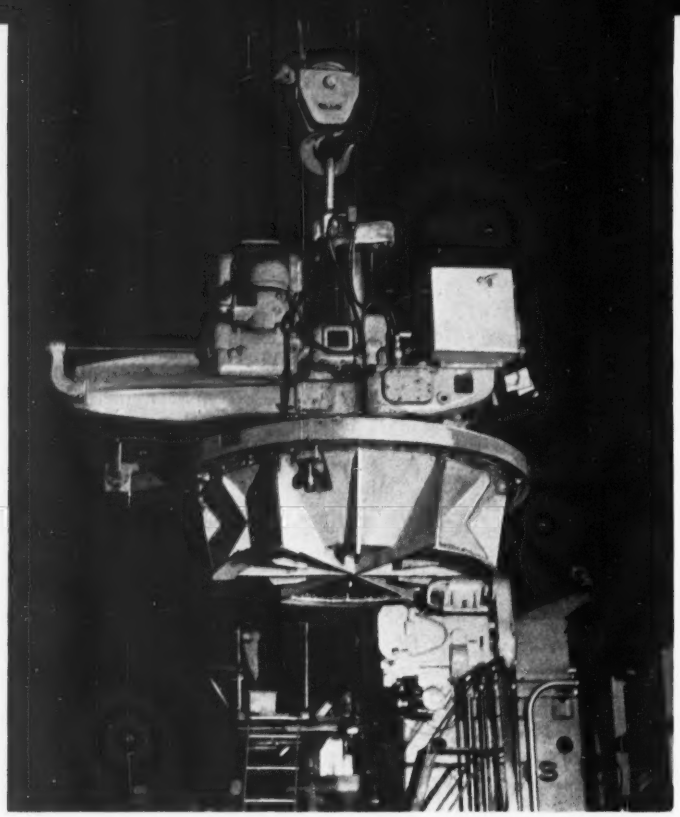


Fig. 2. A traveling crane raises the radial drilling machine and drill jig high above the plant floor, transports them to the work area.

surface follows. These are clearance holes for the bolts that tie the ball race to the turret. Also, other holes are drilled and tapped. The equipment used for this is rather unique and compact. A box fixture similar to that seen in the heading illustration locates and holds the turret in an inverted position. The drill jig, a huge circular ribbed member, contains the entire drilling pattern. Mounted on the center of the jig is a Cincinnati Bickford radial drilling machine having a 4-foot arm.

The jig and machine form a portable unit, seen in Fig. 2, high above the plant floor before being lowered onto the work. A dog locator in the jig engages a bushing in the master trunnion locator to position the jig radially. In Fig. 3, the jig and machine are shown in working position. Hinged covers close over the turret to serve as a platform for the drilling operator.

Quick-change chucks and collets speed drill change-overs. For counterboring the holes, cutter drivers are equipped with stop-collars that main-

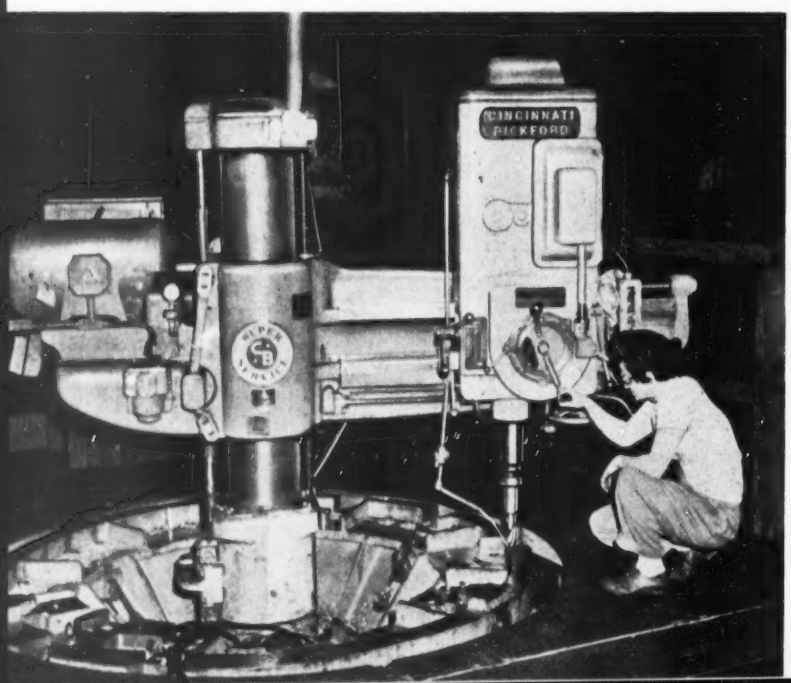


Fig. 3. With the radial drilling machine and drill jig in position in the turret, the covers on top of the fixture are closed to form a platform for the operator.

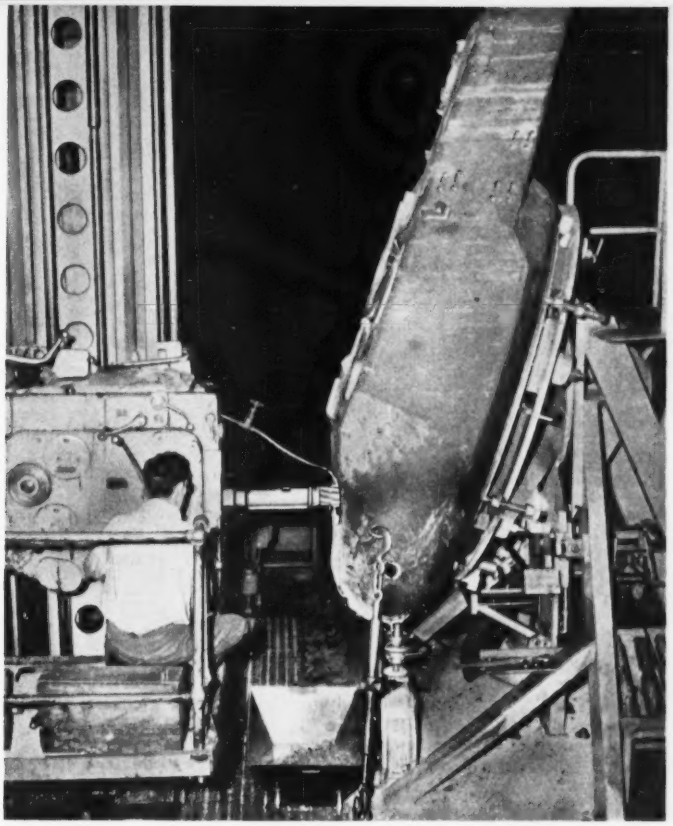


Fig. 4. Since the sides of the gun opening toe in, the fixture is made to pivot the turret, permitting the cutter to feed vertically.

tain proper depth. The taps used are driven in Wickman high-speed attachments.

In Fig. 4, the front gun opening of the turret is shown being face-milled. The Sellers 6-inch horizontal boring, drilling, and milling machine employed for the operation is equipped with a Goddard & Goddard high-speed steel cutter. As the two sides of the gun toe in, the fixture is designed to index pneumatically. One side is milled on an up feed of the spindle, and the opposite side on a down feed. There is an intermediate index point at which the area between the two sides is milled.

Finishing the gun trunnion holes is illustrated in Fig. 5. Here the two holes are bored to within 0.0005 inch of nominal diameter and 0.0005 inch (total indicator reading) of alignment with each other. In this operation, a W.F. & John Barnes two-way boring machine is used.

There are two boring-bars, mounted in individual heads and horizontally opposed. The ways for the heads with respect to the holding and locating fixture for the turret form a "T." The two-way boring machine functions electro-hydraulically and is operated from a centrally located push-button panel.

In the right-hand boring-bar are contained two sets of single-point tools—one for roughing and the other for semi-finishing. Also incorporated in this bar is a quick-change retainer for two block type cutters that face the bosses on the inner ends of the trunnion holes. These cutters are interchangeable with two other cutters that chamfer the inner ends of the bores of the turret. The left-hand bar is used for finish-boring only, and contains a recessed holder for a pair of single-point cutters. Insert type carbide tools are used exclusively, and are set by special gages.

During the automatic machining cycle, there is a single interruption after semi-finishing the bores. At this point, facing and chamfering toolblocks for the trunnion bosses are installed in the right-hand bar. By this means, the distance between the bosses can be held to within 0.002 inch so that the gun mount can be installed correctly. Facing the bosses also establishes the center line of the vehicle in the turret assembly, and assures the proper functioning of the gunfire control mechanism.

Mounted on the Barnes machine as a supplementary piece of equipment is a Versa-Mil. This is a small self-contained milling machine that faces the gun elevation stop to an accurate distance from the trunnion bores. It operates after the finish-boring has been completed.

Next, the trunnion bores are carefully honed at another machine. Following a check on the diameters with a Sheffield air gage, the gun trunnion pins are ready to be shrink-fitted to the bores. The pins are immersed in a bath of dry ice and acetone, shrinking approximately 0.003 inch in diameter. Maximum shrinkage occurs at minus 100 degrees F., at which temperature the pins can be inserted freely into the holes. In

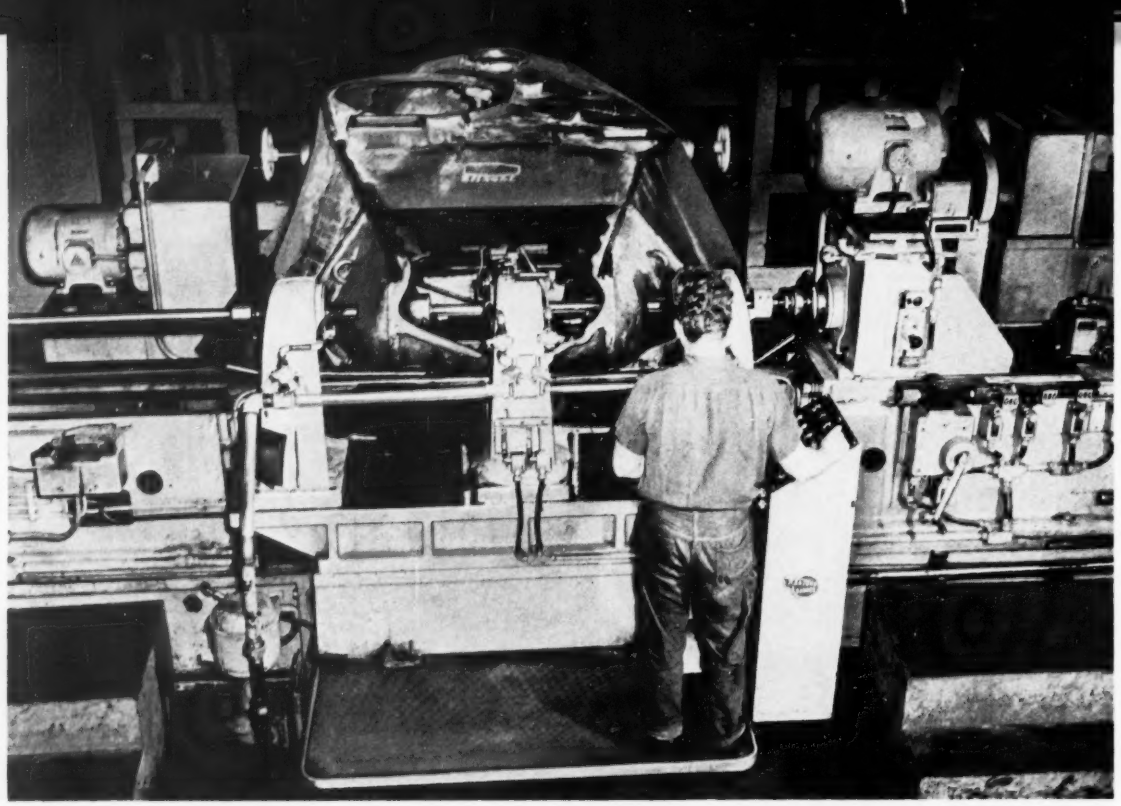


Fig. 5. This two-way machine completes the gun trunnion holes. An integral standard milling attachment faces the gun depression stop.

returning to room temperature, the pins expand and the required fit is produced. All subsequent positionings of the turret are located directly from the pins.

One of the most critical operations on the turret is the machining of the mounting pads to which the gunfire control mechanism is attached. These pads are located in a rather awkward position for ideal machining conditions, and both horizontal and vertical parallelism to the trunnion pins must be held to within 0.002 inch.

The position of the turret during this operation, which is performed on a Gray 6-inch horizontal boring, drilling, and milling machine, is vertical with the nose pointing downward. A view of the work set-up, Fig. 6, shows the elaborate holding structure that was devised. Accurate positioning of the turret is essential, since any error in the set-up will be projected into the pads and affect the gunfire control mechanism.

In Fig. 7 is a view of the work area. The spindle of the machine extends about 36 inches to reach the pads. To insure adequate rigidity and avoid chatter, a cast-iron stabilizer, containing a bronze sleeve is bolted to the flange around the spindle.

Another precision operation consists of machining the area on the roof plate of the turret to which the commander's cupola is later welded. This is a circular strip, approximately 2 inches wide, with an inside diameter of 30 1/2 inches.

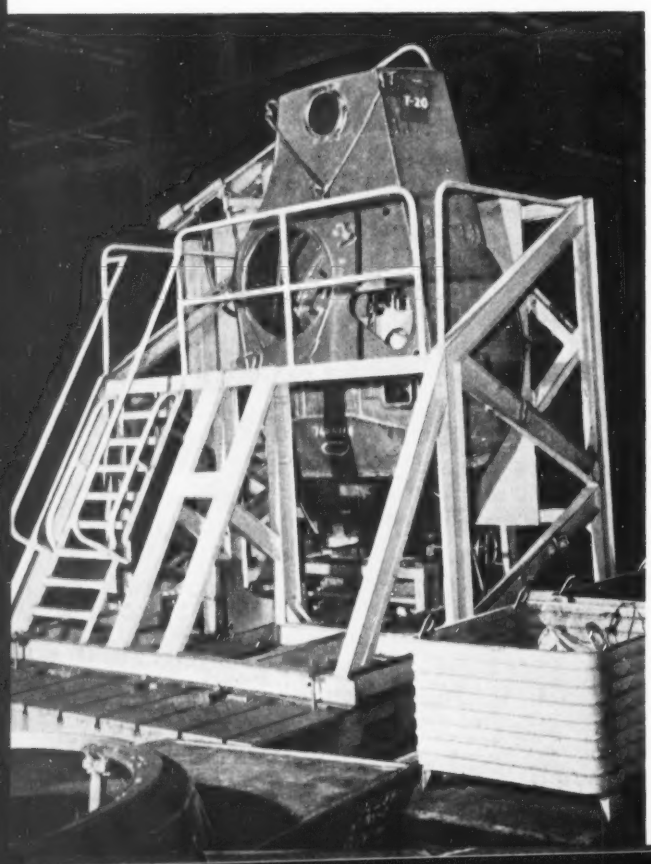


Fig. 6. Massive fixtures such as this permit many machining operations to be performed with conventional machine tools.

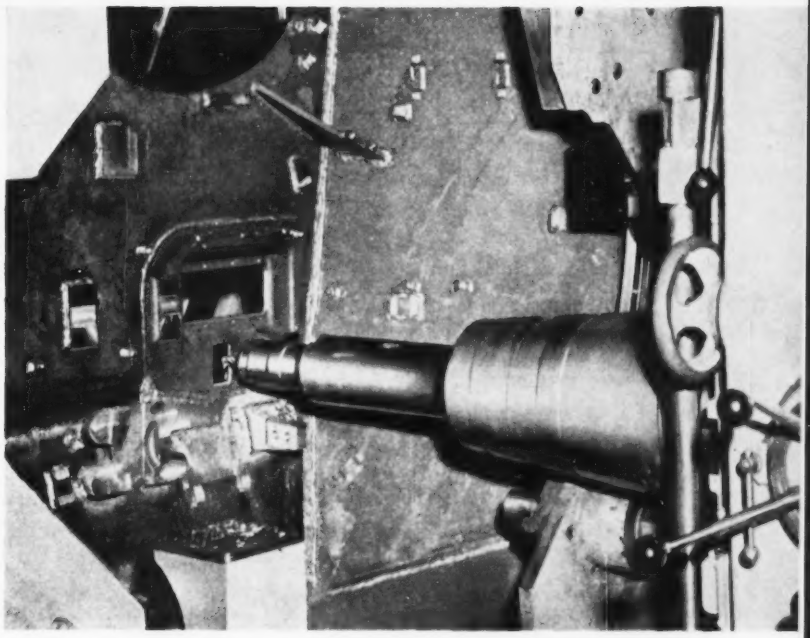


Fig. 7. A cast-iron stabilizer gives this milling operation accuracy, despite the excessive extension of the spindle.

Accuracy here is essential; any out-of-parallelism with the trunnion pins by more than 0.005 inch affects the truth of the sighting mechanism.

A 14-foot Betts vertical boring mill is used. One rail-head of the machine is equipped with a single-point carbide cutter that faces the cupola surface. An Ex-Cell-O grinding unit mounted on the other rail-head then produces the required degree of parallelism in the surface.

Through ingenious design of massive fixtures, conventional machine tools have been able to handle the majority of machining operations on the turret. Careful planning of equipment has provided a flexible arrangement of facilities that can be adapted to turret production for other military vehicles, should the Cleveland Tank Plant be called upon to do so in the interests of the defense effort.



New officers of the National Tool & Die Manufacturers Association are, (left to right) treasurer, Philip R. Marsilius, vice-president of Producto Machine Co., Bridgeport, Conn.; second vice-president, Joseph N. Huser, president of B & H Specialty Co., Inc., Indianapolis, Ind., president, Herbert C. Murrer, president of Murrer Tool Co., Inc., Cincinnati, Ohio; first vice-president, Jerome H. Stanek, vice-president of Stanek Tool & Mfg. Co., Milwaukee, Wis.; and secretary, Albert Goldman, vice-president of Atlantic Mfg. Co., Philadelphia, Pa.

Materials OF INDUSTRY

The properties and new applications of materials used in the mechanical industries

Lead-Bearing Alloy Steels that Offer Fast Machinability

Two lead-bearing alloy steels have been made available by Joseph T. Ryerson & Son, Inc., Box 8000-A, Chicago 80, Ill. The first, Rycut 40, is standard AISI 4140 alloy with 0.15 to 0.35 per cent lead added. It is said that this steel will machine up to 50 per cent faster than standard medium-carbon alloy steels. The addition of lead does not change the heat-treating characteristics or hardenability. In fact, the mechanical properties of both the leaded and non-leaded steels after heat-treating are said to be identical.

Rycut 20, the second alloy being introduced, is a low-carbon carburizing grade of lead-bearing AISI 8620 steel. This steel embodies the same improvement in machinability as Rycut 40, and may be heat-treated in the same manner as standard AISI 8620 with similar results.

Alkali Type Cleaning Compound for Aluminum

An alkali compound that will not etch or discolor aluminum, but that will thoroughly spray-wash heavy soils from it, has been brought out by the Van Straaten Chemical Co., 546 W. Washington, Chicago, Ill. The compound, Vantrol 5541, is non-toxic and non-flammable. It has been safely used on all aluminum and zinc alloys, and will not tarnish or discolor other non-ferrous metals such as brass, copper, and bronze. The cleaner can also be used for ferrous metals, in which case the washed parts are inhibited against rust.

Cutting Oil Solvent Exhibits Safety Features

The announcement of a solvent for cutting oils has been made by Tect, Inc., Cortlandt and Erie St., Dumont, N. J. This diluent, called Tecsolv No. 427, can be used to replace carbon tetrachloride in diluting various cutting oils. Its use has been effective in lathe work on fine threading jobs and in a great variety of machining operations where finish is important. Tecsolv No. 427 is non-flammable, is approximately one-tenth as toxic as carbon tetrachloride, and has approximately the same evaporation rate.

Titanium Now Available in Thin Gages and Foil

The availability of commercially pure titanium, precision-rolled to very close tolerances in thin-gage strips and foil, has been announced by the Industrial Division, American Silver Co., Inc., 36-07 Prince St., Flushing 54, N. Y. Titanium, a strong lightweight metal, can be compared favorably in strength to many steels, but weighs only 56 per cent as much. The metal possesses good corrosion resistance and the ability to withstand high temperatures. It is rolled from strip as wide as 8 inches, down to a thickness of 0.0005 inch within tolerances as close as plus and minus 0.0001 inch.

Typical uses for titanium strip include cowlings, ducts, fire walls, structural parts, power plant components, fittings and fastenings in the aircraft industry; condensers, heat exchangers, mufflers, metering equipment, valves, pumps in the marine industry; and equipment for chemical processing, instrumentation, refineries, and food processing.

Flux Facilitates the Welding of Aluminum

An aluminum welding flux that allows the operator to see exactly what he is doing while welding, has been announced by the Solar Aircraft Co., 2200 Pacific Highway, San Diego 12, Calif. Type 202, as the flux is called, starts to reduce oxides immediately upon application and continues to do so throughout the heating cycle. It becomes liquid at that point in the heating cycle when the metal is ready to weld, and therefore serves as a good temperature indicator. Other advantages claimed for this flux are easy removal after welding, no corrosive pitting of parent metal, ability to employ oxy-acetylene welding, and availability as a back-up material

on butt or T-joints to control penetration. The flux can also be used to eliminate the oxide notch on the back of the work.

"Baked" Protective Coatings that Cure at Room Temperature

Protection for the surfaces of ducts, machinery, bottle washing and filling equipment, vessels, walls, tanks, etc. is afforded by a coating that is similar to a baked coating but which is cured at room temperatures. This coating, called "Nerva-Kote Tae," resists alkalies, acids, and solvents; adheres to all surfaces; and exhibits good flexibility and long life. Other properties include weather, impact, and abrasion resistance. It dries fast and may be recoated in six to eight hours. Uses have included corrosion-resistant applications involving alkali cleaners, soaps, and other chemical reagents, and also as a maintenance replacement to baked coatings where heat could not possibly be applied. The Nerva-Kote Division, Rubber & Plastics Compound Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y., is the manufacturer of this coating material.

Metal Cleaner that Produces Rust-Inhibitive Coating

An odorless cleaner known as "Solo-Phos"—which removes grease and tar, cleans off chips, and gives a rust-inhibitive phosphate coating to ferrous metals, aluminum, and zinc—has been developed by the Whitfield Chemical Co., 14225 Schaefer Highway, Detroit 27, Mich. This cleaner reacts with organic or metallic soils, and provides an ideal base for painting. It can be applied in concentrated form by spraying, flushing, or dipping. After application, the treated part should be spray-rinsed. Although used mainly for one-step cold cleaning and phosphatizing of metals, water solutions of this cleaner can be used hot or cold in either tank- or hand-washing applications. It will not attack rubber-tired wheels or painted and plated surfaces. The flash point of the cleaner is above 200 degrees F.

Copper Dipping Process that Brightens and Passivates

The brightening and passivation of copper and most copper alloys by a simple chemical dip and rinse process has been announced by the Rossaul Company, 170 Fifth Ave., New York 10, N. Y. Rossaul Copper-Brite, as this process is named, removes atmospheric oxides and simultaneously passivates the metal so that it will resist oxidation without further treatment for periods ranging from three to six months, depending on atmospheric conditions. Materials used in the process are non-toxic, non-fuming, completely safe to handle, require no special ventilation, and will not etch or discolor silver solder.

Electrolytic Stripper for Zinc Base Die-Castings

A new liquid product for the electrolytic stripping of defective copper, nickel, and chromium plates from zinc base die-castings has been placed on the market by Enthone, Inc., Dept. M, 442 Elm St., New Haven, Conn. The product, Enthone Compound L-88, is available as a ready-to-use liquid. Nickel and chromium coatings are more rapidly stripped than copper. The stripping is accomplished by making the die-casting the anode in a solution of the compound and employing a 6-volt source. As a result of the stripping, a passive film is formed on the die-casting that inhibits further attack. Refinishing of the die-casting is accomplished by a light buffing operation.

Physical Properties of Kentanium Compositions

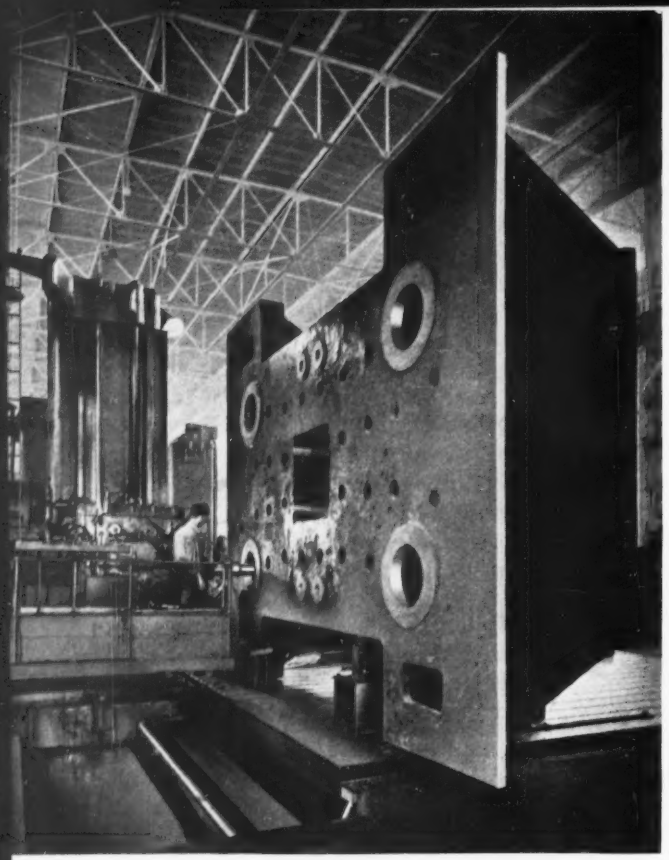
Additional data on Kentanium, which was described in April, 1953, MACHINERY, is given in the table below of typical Kentanium compositions made available by Kennametal, Inc., Latrobe, Pa. This material is a cemented titanium carbide with small percentages of tantalum and columbium carbides, using nickel as an auxiliary metal or "binder."

Physical Properties of Typical Kentanium Compositions

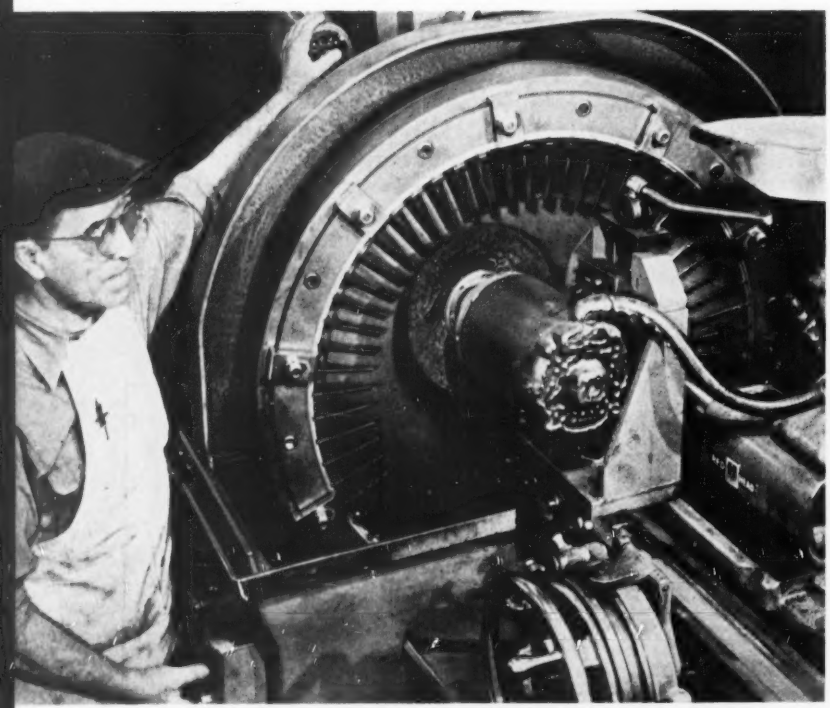
Kentanium Grade	Density, Grams per Cubic Centimeter	Hardness, Rockwell A	Modulus of Rupture Strength, Pounds per Square Inch	Tensile Strength, Pounds per Square Inch	Modulus of Elasticity, Pounds per Square Inch	Coefficient of Thermal Expansion, Inch per Inch per Degree F. × 10^{-6}	Thermal Conductivity, Calorie per Degree C. per Centimeter per Second
K151	5.5	89.5	190,000	....	....	....	....
K151A	5.8	89.5	175,000	....	57,000,000 (sonic test)	4.28	....
K151B	5.7	89.5	150,000	95,000	49,000,000	....	....
K152A	6.2	84.5	150,000	....	....	....	....
K152B	6.0	85.0	210,000	100,000	47,000,000	....	0.0768
K153B	6.3	82.8	185,000	110,000	41,000,000	5.8	....
K161B	5.7	90.2	165,000	76,000	60,000,000	....	....
K162B	6.0	89.0	230,000	115,000	59,000,000	5.3	0.0724
K163B	6.2	87.4	210,000	130,000	56,000,000	5.4	....

In Shops Around

Camera highlights of some interesting operations performed in various metal-working plants throughout the nation

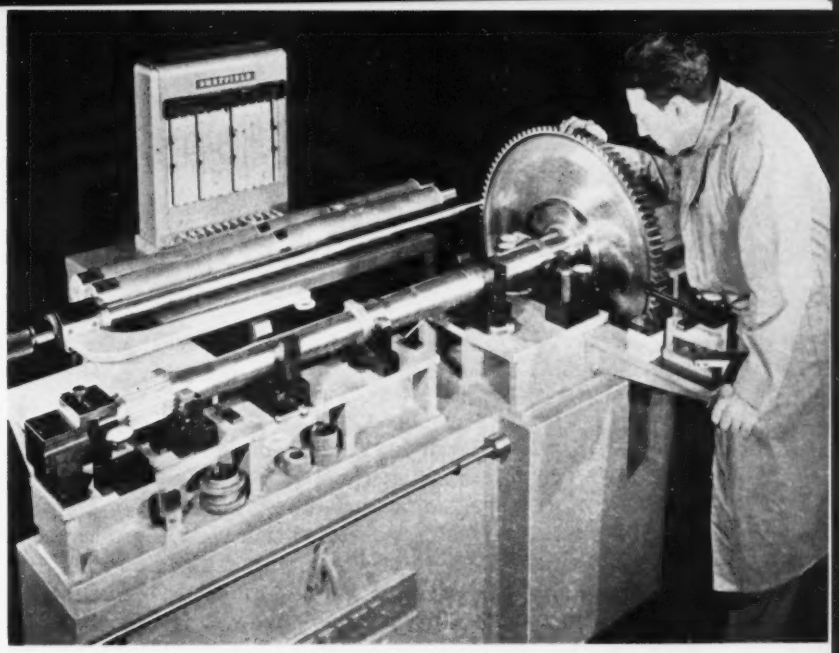


A mammoth steel casting being machined on an 8-inch horizontal boring mill at the Lake Erie Engineering Corporation, Buffalo, N. Y. The work, weighing 168,000 pounds, is the bed for a 5000-ton laboratory press designed and built for the advanced study of metals under pressure.

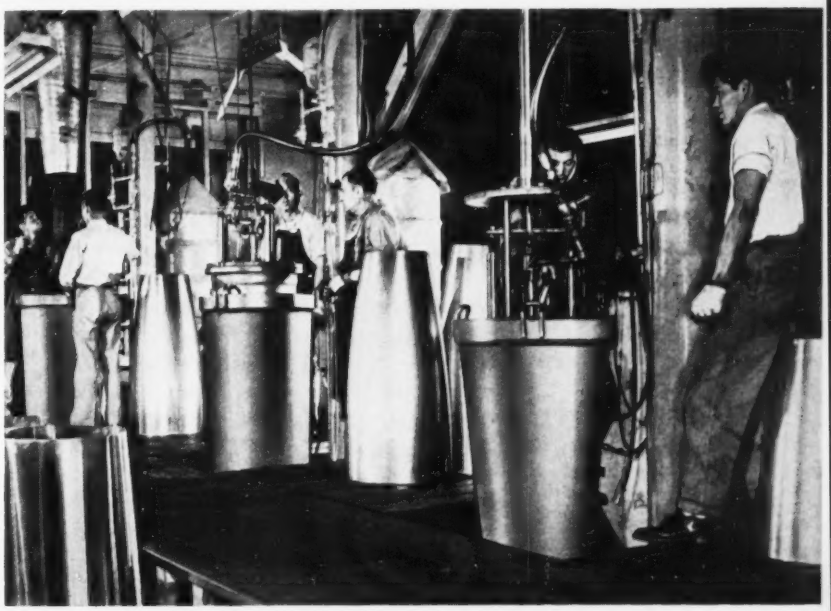


Ends of stator blades for J-47 jet engines being deburred and blended with the blade bodies by a motorized brush at the Packard Motor Car Co. The operation is performed on a Heald machine with an Osborn brush, in connection with the grinding of the blade ends. Following grinding, the brush rotates rapidly in one direction for thirty seconds, then reverses the direction for another thirty seconds.

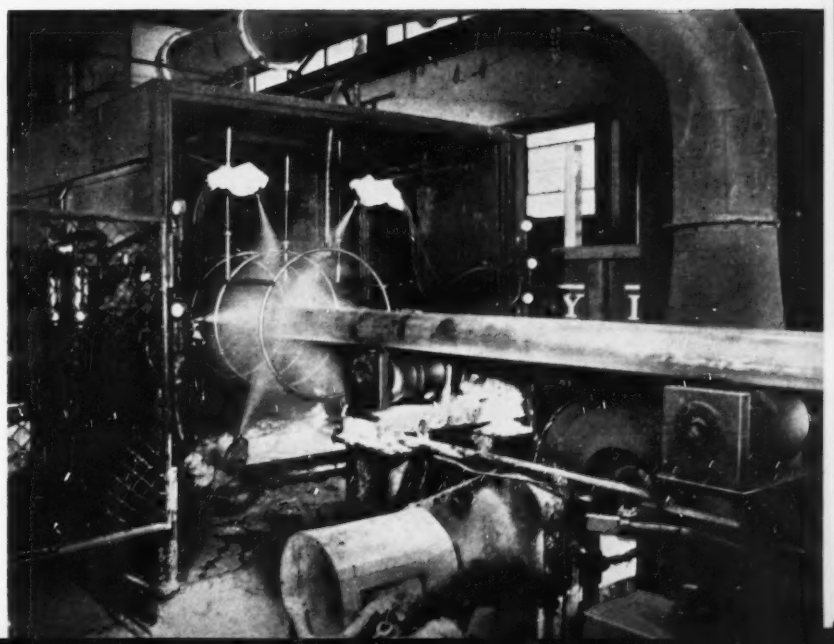
the Country



Inspecting a turbine shaft and wheel assembly for jet engines on a special Precisionaire gaging machine recently developed by the Sheffield Corporation, Dayton, Ohio. Size, concentricity, and run-out of internal and external diameters and faces are checked by air spindles, gaging cartridges, and "Airsnaps." Each inspection point has its own glass column in a central "Airechart."



Jettisonable fuel tank parts are stretch-formed in a single, fast operation at the Pastushin Aviation Corporation, Los Angeles, Calif. Within two minutes Heliarc-welded blanks of aluminum or steel become shapes of compound contour, free of wrinkles and tool marks. Each machine consists of an elevating mechanism and a rubber punch that expands hydraulically against a steel die contoured to finished part size with Tool Plastic.



Seamless steel pipe is being spray-painted at a speed of about 500 feet per minute at the Ambridge, Pa., plant of the Spang-Chalfant Division of the National Supply Co. In the spray booth, four circular electrodes and six guns are arranged around the pipe. The guns open automatically when the leading end of each length reaches the spraying station, and close as soon as the pipe has passed through.

When and How to Use Carbides in Machining Stainless Steel

By G. J. Stevens, Machining Engineer
Armco Steel Corporation

SHOULD we use carbides on it? This question is often raised when a machine shop undertakes a new stainless-steel job. Today, many plants answer the question affirmatively, as is evidenced by the high production schedules they maintain. But more than a mere substitution of carbide for some other cutting material is involved. This article is a digest of the best current practice of machining stainless steel with carbides, and should prove helpful where troubles are still being encountered.

Grades of Carbides

Three grades of sintered carbide are commercially available for stainless steel. One, referred to as the "edge-wear" grade, is relatively hard and highly abrasion-resisting. Another, the steel-cutting grade, possesses somewhat greater toughness, but is less abrasion-resisting. The third grade is least abrasion-resisting, but is tougher and more impervious to shock than are the other two. Much literature has become available on applications of the different grades. It is safe to assume that the fabricator is reasonably familiar with it.

For any particular type of stainless steel, the depth of cut and the cutting rate, in combination, influence the choice of carbide grade. For example, the "edge-wear" grade works well on a 1/32-inch deep cut in 1-inch bar stock. The allowable cutting speed in this instance is high, approximately 400 feet per minute. Although the load at the cutting edge (the weakest part of the

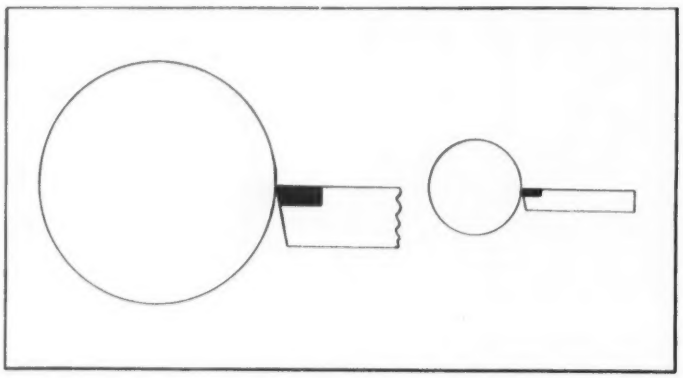


Fig. 1. (Left) If the smaller cutter were employed to turn the larger bar, the depth of cut taken would have to be reduced.

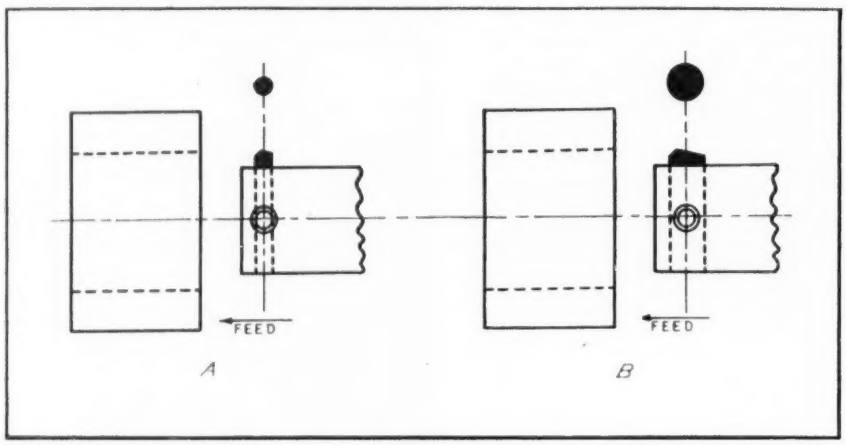


Fig. 2. The greater mass of the cutter shown in view (B) is better able to dissipate heat.

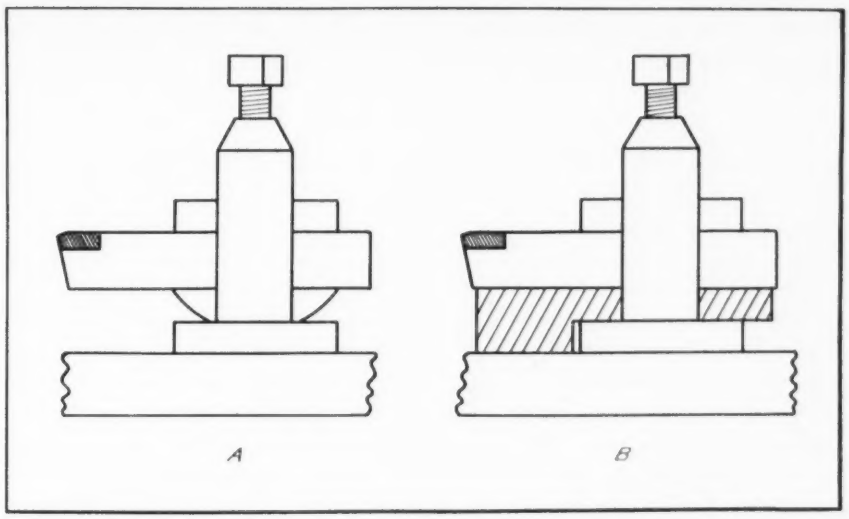


Fig. 3. A solid supporting piece beneath full length of tool body, as in view (B), is essential to withstand the impact of an intermittent cut.

tool) is relatively small, the wear at the edge is considerable at this speed. Resistance to abrasion rather than unusual toughness is the more essential characteristic of the cutter.

But if a 1/16-inch deep cut is taken, the steel-cutting grade of carbide is more suitable. Here, the cutting speed is lowered to approximately 300 feet per minute because of the greater pressures involved. More toughness is required in the tool, even at a sacrifice of some abrasion-resisting ability. Taking a 3/16-inch deep cut further increases the pressures, and requires the shock-resisting grade of carbide. Again it is necessary to lower the cutting speed, this time to approximately 200 feet per minute.

The shock-resisting grade is also used for all deeper cuts, and the cutting speed is lowered correspondingly. A positive back rake reduces the pressures on the tool and enables the cut to be taken with less power.

Set-Up Practice

It is important that the mass of the tool be in proportion to that of the work. Otherwise the considerations in carbide grade selection may be voided. For example, for a 1/32-inch deep cut in stainless steel, an abrasion-resisting grade is recommended, as has been stated. Yet if the mass of the tool is much less than that of the work, and if the tool is not adequately supported, then this grade of carbide would be unsatisfactory. Here, a tough carbide tool ground with ample back rake and run at a reduced surface speed would be more practical. Conversely, when the mass of the tool more nearly matches that of

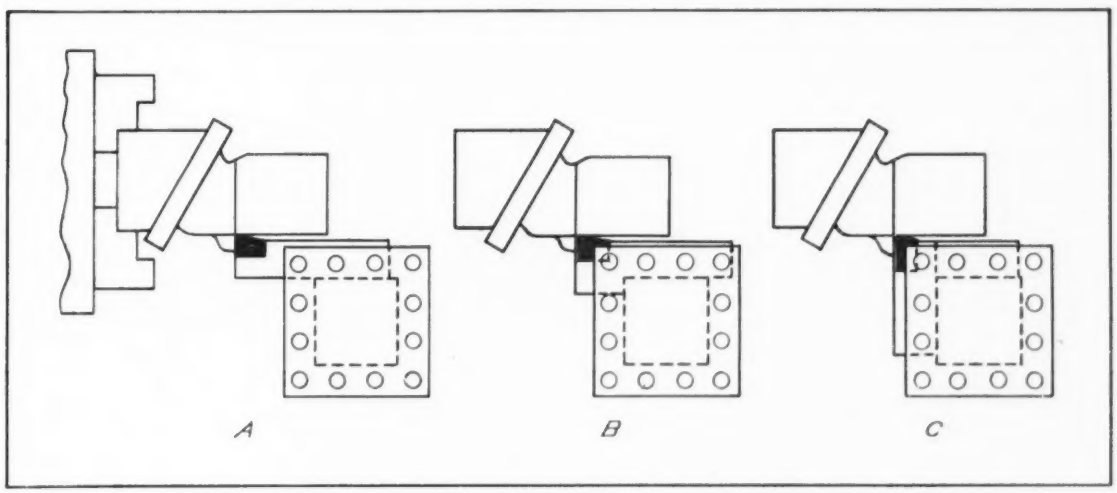


Fig. 4. Because the tool shank extends less and has greater support, the set-ups in views (B) and (C) are better than the one in view (A).

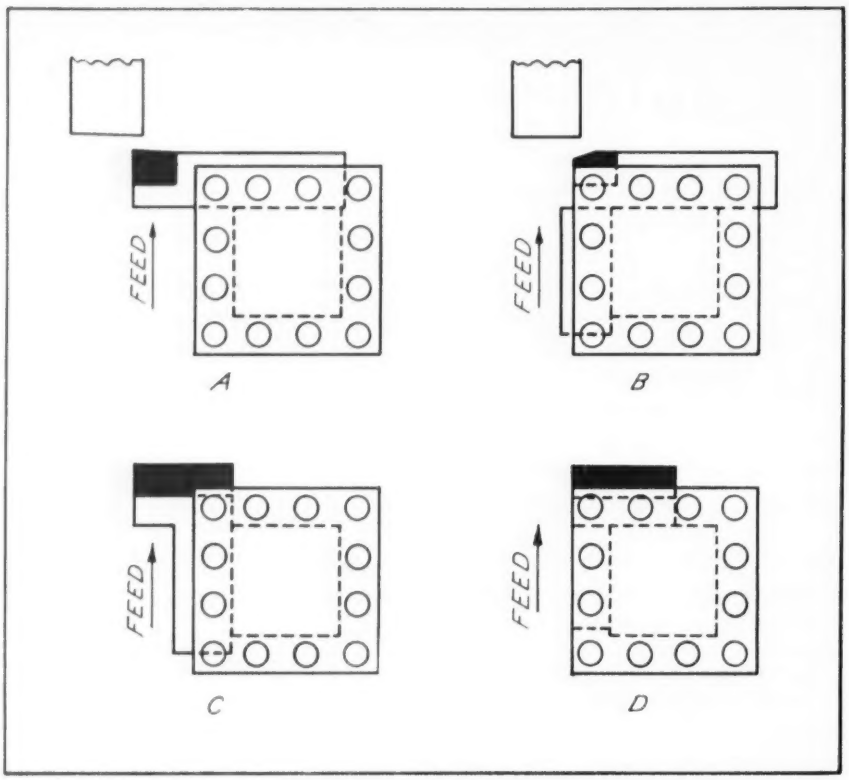


Fig. 5. The lead angle of the facing cutter, view (B), thins out the chip and reduces the pressure imposed on the tool.

the work, and good tool support is provided as well, a heavier depth of cut can be taken at a higher surface speed with the abrasion-resisting grade of carbide. The diagrams in Fig. 1 illustrate proper proportions of tool-to-work mass.

A similar relationship between the tool and the work must be maintained in other machining operations. Seen at *A* in Fig. 2, for example, is a 1/8-inch carbide-tipped bit which was found to be too light to produce a good surface finish in the bore of the work. Satisfactory results were obtained only when a bar containing a 1/4-inch bit, shown at *B*, was substituted. The heavier bit also had a longer useful life, since its greater mass was better able to dissipate the heat that was generated.

With the exception of the free-machining types of stainless steel, set-ups that perform satisfactorily for working mild steel or non-ferrous metal may not always be practical. Two facts must be borne in mind: first, cutting pressures are much higher with stainless steel than with

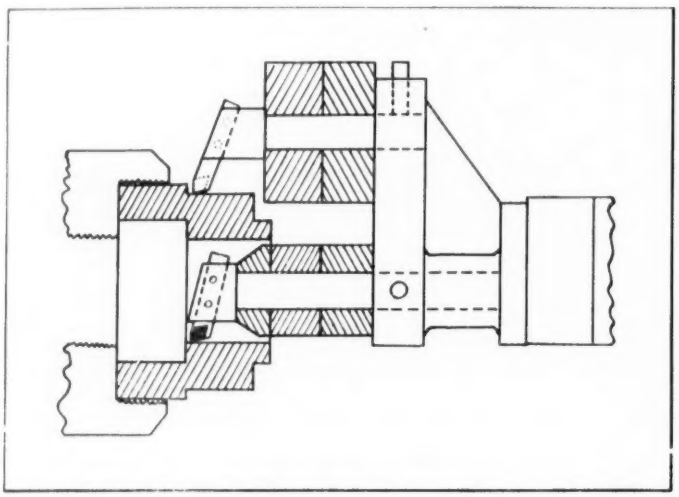


Fig. 6. The spacing collars over the cutterholders improve the accuracy and finish of the work surface by reducing the amount of deflection caused by cutter overhang.

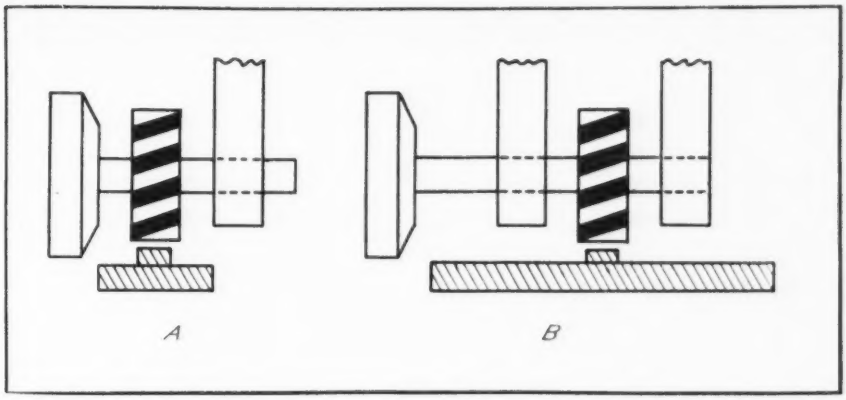


Fig. 7. If the cutter cannot be located near the spindle, an intermediate arbor support should be provided in the set-up.

mild steel; and second, the heat generated in cutting stainless steel is not readily dissipated.

Another pertinent observation is that the wrong grade of carbide properly ground and supported will usually outperform the correct grade of carbide improperly ground and supported. Difficulties encountered in machining are often overcome simply by making the set-up more rigid rather than by changing the grade of carbide used.

A carbide-tipped tool in a conventional engine-lathe toolpost is shown at *A* in Fig. 3. The tool is used to take an intermittent cut, and is ground with a slight negative back rake to direct the cutting forces downward in the direction of the cross-slide of the machine. Despite the ability of carbide to withstand high-compression loading, it can be readily seen that because of the unsupported area to the left of the rocker, the tool will be subjected to considerable vibration, and probably will fail rapidly. A change in the support beneath the tool, as in view *B*, makes the set-up more substantial.

In Fig. 4 a carbide turning tool held in a square turret is illustrated at *A*. As can be seen by the shape of the work, the tool takes an intermittent, or impact, cut. Should the turret station facing the spindle of the machine be open, a cutter having a stronger body, as in view *B*, can be substituted. Then again, the shank of the tool can be reinforced, as in view *C*.

For facing, the set-up seen at *B* in Fig. 5 is superior to that at *A*. In addition, the lead angle of the tip in *B* directs the forces of impact to the center of the cutter blank. In views *C* and *D*, wide forming tools are shown in a square turret. Since such cutters are subjected to heavy vibration and pressure in stainless steel, the shank style in *D* is less likely to work loose in the turret. For severe plunge-forming cuts, the work should preferably be supported in a collet chuck. Such a chuck grips the work effectively, and there is less overhang from the spindle than with a jaw chuck.

A combined turning and boring turret lathe operation is shown in Fig. 6. The multiple cutter-head attached to one of the stations of the hexagon turret contains the cutter-holders in proper radial location. Since the holders and cutters have to extend considerably because of the length of the work surfaces, spacing collars are fitted over the holders for added rigidity.

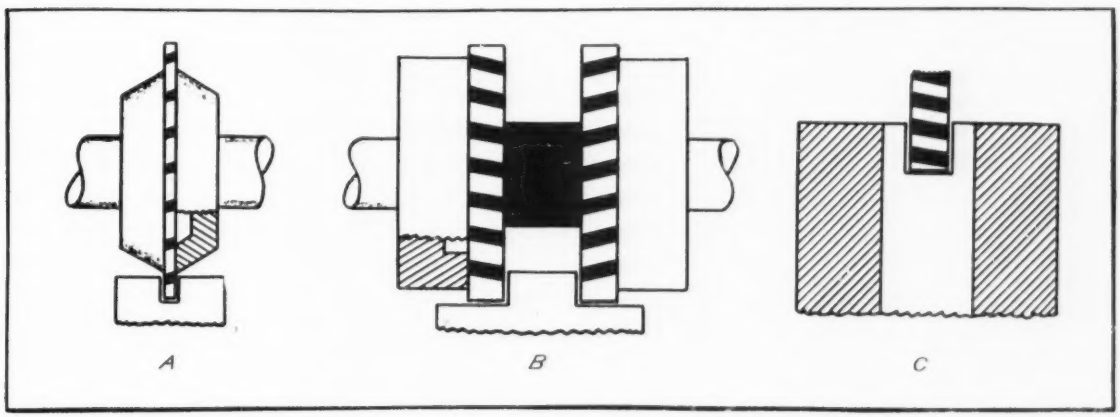


Fig. 8. Views (A) and (B) typify good cutter support; view (C) shows metal backing along sides of work-piece.

For milling with an arbor type cutter, every effort should be made to locate the cutter as near the spindle as possible, indicated at *A* in Fig. 7. However, where the shape of the work does not permit such a set-up, then an intermediate arbor support, view *B*, should be employed. Slotting cutters can be backed up with cast-iron or steel collars, as at *A* in Fig. 8. The straddle-milling set-up, *B*, is also provided with back-up collars to prevent the cutters from deflecting under pressure. Cutters so equipped can withstand heavier loads because of their greater rigidity and the added flywheel effect of the collars.

When milling thin stainless-steel sections, the work-holding method should provide metal backing along the full depth of the cut, view *C*. This practice is important because of the relatively poor heat conductivity of stainless steel.

Cast-Iron and Steel Segments for Third Tube of Lincoln Tunnel

FOUNDING and machining of cast-iron and steel segments for the outer casing of the world's most modern vehicular tunnel are being performed in the shops of the Bethlehem Steel Co., Bethlehem, Pa. Starting in April, 1954, the segments will be installed as the lining of the $90,000,000 third tube of the Lincoln Tunnel which connects New York and New Jersey.

Fifty 3400-pound segments are being cast daily, but the quantity will soon be increased to eighty per day. As cast, the segments are nearly 7 feet long, 32 inches wide, and 14 inches deep. After the castings have cooled, sand and scale are rapidly removed from the surfaces by shot-blasting, using newly installed Pangborn Roto-blast equipment.

From the foundry, the castings are transported to one of the machine shops where they are finished to close tolerances to insure a tight fit when bolted in position as the outer casing of the tunnel. Ingersoll and Newton duplex milling machines complete the sides and ends of the work. Face mills with carbide-tipped inserted blades are used. A feed rate of 10 inches per minute is maintained when cutting the cast-iron segments. Dust collectors and chip removal conveyor belts help to keep the immediate work area clean.

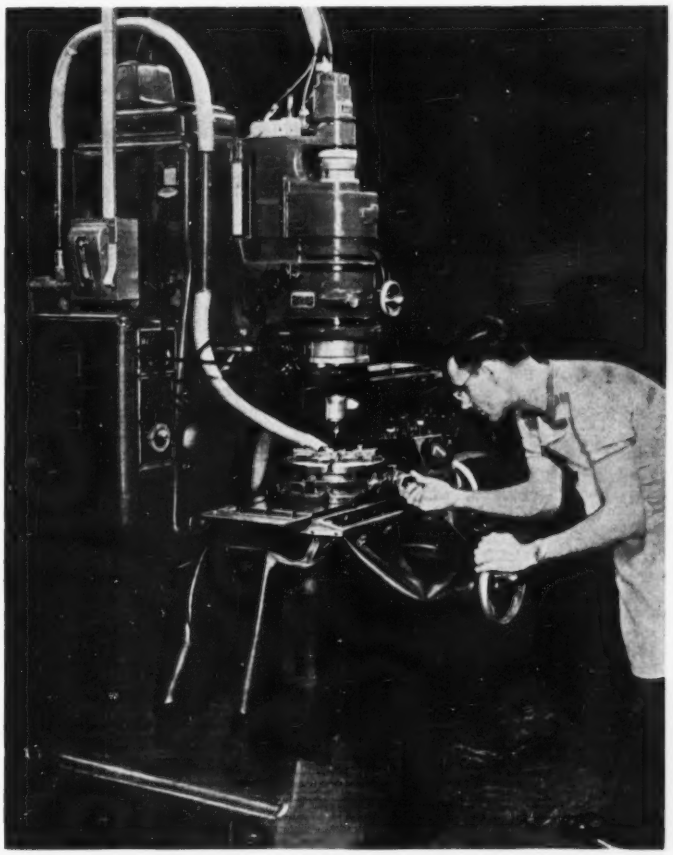
Subsequently, the segments are located in a special machine that simultaneously drills twenty 2-inch diameter holes through a minimum wall thickness of 2 3/4 inches. These holes are located in all four edges of the castings.

At the construction site, the segments are placed in position behind a shield which is pushed under the river by hydraulic jacks. Since the external diameter of the tube is 31 feet, it takes fourteen segments and, in addition, a small locking segment to form a complete ring of the outer tunnel lining. More than 28,000 iron segments will be used in the tube, which will have a portal-to-portal length of 7944 feet. Approximately 1800 steel segments will be employed to withstand bending stresses at points where the tunnel enters rock. A ring of segments was assembled vertically at the Bethlehem Plant to illustrate the method of installing them in the tunnel.



Segment is secured to machine table in a special fixture during one of the machining operations required on the casting before assembly in a completed ring of the lining for the Lincoln Tunnel.

Oscilloscope Reduces Cost of Jig Grinding Operations



Increased production and lowered costs are being realized in jig grinding operations at a Western Electric plant by employing an oscilloscope to reveal the contact pressure between abrasive and work

By W. W. Rea, Engineer
Machine and Tool Design
Allentown, Pa., Plant
Western Electric Co., Inc.

WHEN grinding with diamond-charged mandrels, often employed instead of conventional abrasive wheels for grinding holes less than 1/8 inch in diameter, no sparks are produced. This condition makes it difficult to determine the contact pressure between the abrasive and the work. To overcome this, it has been standard practice to connect an electronic audio amplifier to the work, thus producing an audible sound proportional to the pressure with which the mandrel contacts the work.

At the Allentown, Pa., plant of the Western Electric Co., results achieved with an audio amplifier in finishing small multiple holes on a jig grinding machine have not been too successful. With such a set-up, the operator was supposed to be able to detect the moment the abrasive made contact with the work and whether maximum metal removal was achieved without overload, simply by interpreting the changes in the volume of the audio signal.

Also, the audio signal was supposed to reveal irregularities such as bell-mouth and taper conditions in the hole being ground. It was found that the sensitivity of the amplifier was insufficient to reveal small changes in grinding pressure, and the noise level in the immediate area of the jig grinding machine made it difficult to interpret the sound signals. Furthermore, interpretations of the signals varied widely among different operators.

To cope with these problems, three men in the tool-room—J. R. Danek, A. H. Kend, and G. P. Widdicome—conceived the idea of using an oscilloscope to reveal the contact pressure between the abrasive and the work. This new method proved successful, resulting in substantial reductions in cost and increased production by saving an estimated 30 per cent in jig grinding time on tools with multiple holes. The oscilloscope is highly sensitive to variations in grinding pressure, and the variations are clearly visible on its screen. Thus, the operator can use a feed rate at which maximum metal removal can be accomplished without overload.

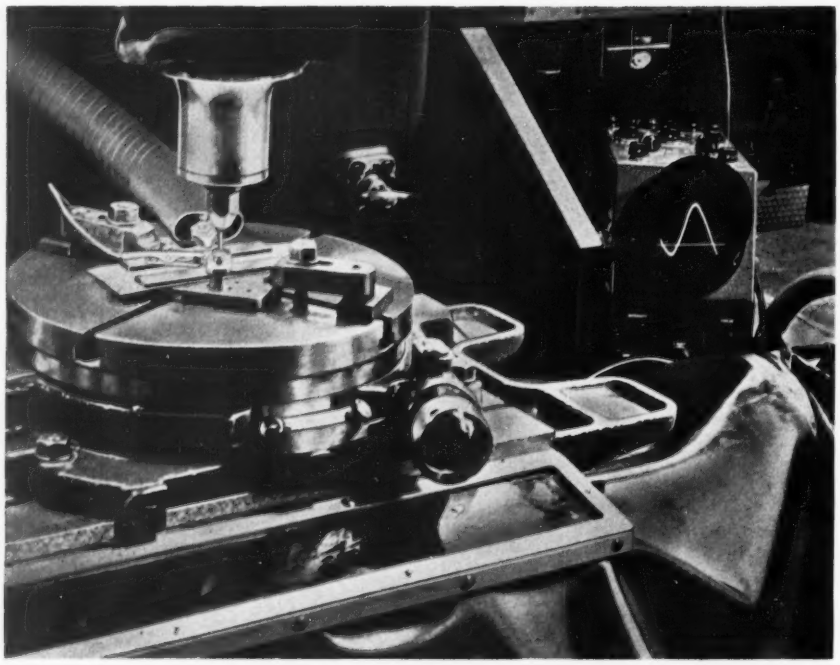


Fig. 1. A standard commercial oscilloscope, mounted on the right of this jig grinding machine, is used to reveal contact pressure between the abrasive and the work.

Additional savings are also being realized through the use of the oscilloscope to reveal irregularities which would cause subsequent rejection of the work. Detection of such irregularities as excessive run-out of the hole, taper, or bell-mouth early in the processing eliminates much of the time previously spent in grinding scrap parts.

A typical installation, showing the oscilloscope mounted on the right of a Moore jig grinder, is illustrated in Fig. 1 and the heading illustration. The work-piece is held in an insulated mounting or on insulated parallels, as shown in the schematic drawing, Fig. 2. The oscilloscope is electrically grounded to the frame of the machine and connected to the work. An external source of alternating-current voltage, in series with a suitable resistor, is connected in parallel—one lead attached to the work and the other grounded to the work-table of the jig grinder.

The grinding medium, in this case a diamond-charged mandrel, must be electrically conductive. During grinding, the electrical impedance between the work and the machine frame varies inversely in proportion to the contact pressure between the mandrel and the wall of the hole being ground. This change in impedance is shown visually by the height of the pips, thus giving a very sensitive measure of the variations in grinding pressure that occur due to the run-out of a drilled hole, increasing size of the hole as it is ground, and changes in the rate of feed. Such indications are not affected by noise in the vicinity of the jig grinding machine.

Initial contact between the diamond-charged mandrel and the bore of the hole to be ground is instantly revealed. The sensitive response to small changes in pressure enables the operator to maintain an optimum feed rate. This continual adjustment of the feed to keep the pressure at the maximum that is allowable without overload, has shortened the over-all grinding time.

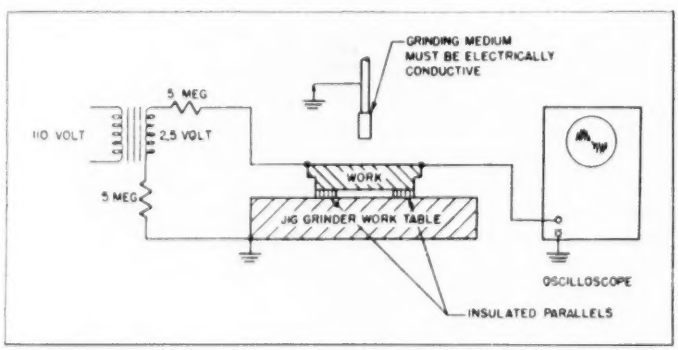


Fig. 2. Schematic drawing of set-up shown in Fig. 1. Work is mounted on insulated parallels and electrically connected to oscilloscope and source of alternating current.

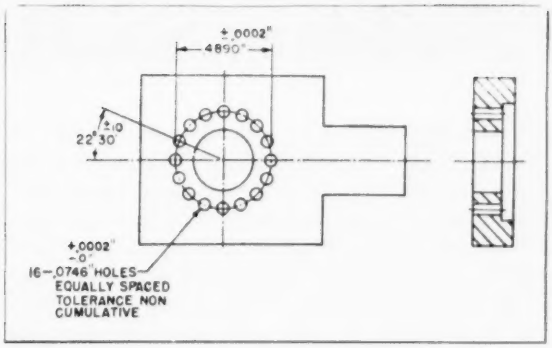
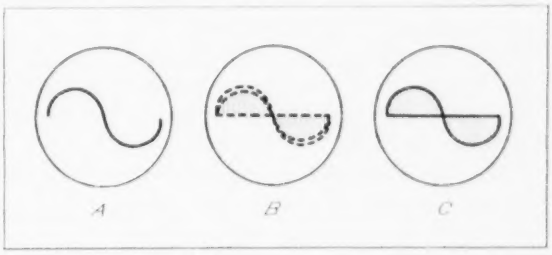


Fig. 3. Equally spaced holes in this drilling and reaming bushing plate are finished on a jig grinder equipped with an oscilloscope.

Fig. 4. (Below) Schematic drawing of indications seen on oscilloscope screen: (A) mandrel not in contact with work; (B) grinding an eccentric hole; and (C) grinding a true hole



A typical work-piece produced with the set-up illustrated is shown in Fig. 3. The equally spaced holes, 0.0746 inch in diameter, in this drilling and reaming bushing plate are ground to a tolerance of 0.0002 inch. For this operation, a steel mandrel, 3/64 inch in diameter and impregnated with diamond dust, is rotated at 45,000 R.P.M., eccentrically moved on a 0.006-inch radius, and slowly traversed vertically to grind the bushing-plate holes to their final size.

In grinding such parts having multiple holes, it is standard practice to run a trial grind in each hole to determine (by means of the oscilloscope) if any defects or irregularities are present. If any are detected, the work-piece is scrapped without spending any additional time to complete it. With the other method, defects could not be detected until all grinding was completed and the work had been removed from the jig grinder for inspection. Now, the operator can predict in advance (from the pattern on the oscilloscope viewing screen) that a particular hole will not clean up by the time it has been ground to final size.

A schematic drawing illustrating the indications visible on the oscilloscope screen during various stages of the grinding operation is shown in Fig. 4. The indication at *A* is one seen when the mandrel is not in contact with the work. When the mandrel is in contact with an eccentric hole in the work-piece, a pattern varying between the broken lines at *B* is visible on the screen. If the hole is true, the pattern is steady during the grinding operation, as pictured by the solid line at *C*. Although the use of an oscilloscope in connection with jig grinding operations is not limited to the manufacture of bushing plates, the operation described clearly exemplifies the benefits achieved by its use.

The Allentown Plant is making use of this new grinding technique to produce several bushing plates of the type illustrated and described. Also, this plant performs many other precision grinding operations which are difficult to observe and control. Although conventional grinding wheels are normally non-conductive, they can be used in conjunction with the oscilloscope if the abrasive is first impregnated with a conductive material such as carbon. One method of accomplishing this is to dip the wheel in an Aquadag solution (colloidal graphite and water) and bake out the water. After baking, silver paint is applied to establish an electrical connection between the impregnated surface of the abrasive and the mandrel.

It is conceivable that the oscilloscope might eventually be used to control the grinder feed, thus automatically maintaining maximum permissible grinding pressure on the work without constant attention of the operator. Such an elaborate set-up could not, however, be justified unless the nature of the work were repetitive and the quantity sufficient to offset the investment.

* * *

Stretch-Forming of Thin Foil Stock

Successful attempts to stretch-form thin foil stock have been announced by the Longren Aircraft Co., Torrance, Calif. Using Longren type hydraulic stretch presses with hydraulic flexible skin jaws, the company has stretch-formed 0.005-inch thick Type 302 stainless-steel foil, and 0.005-inch thick Inconel foil. This is believed to be the first time that material of such thin gage has been stretch-formed.

The project was conducted at the request of the Johns-Manville Co., and proved that this method of forming such materials can be successfully applied to forming foil used in laminated honeycomb insulating panels that are being designed into new types of aircraft. It is considered that this method of forming may eliminate the need for expensive punches and dies.

Machine Tool Builders Study

UNUSUALLY thought-provoking papers focussing on the problems of selling machine tools in today's markets were program features of the fifty-second annual meeting of the National Machine Tool Builders' Association. Convening at the Boca Raton Hotel and Club, Boca Raton, Fla., the meeting ran from November 10 to 13.

"Are We Prepared for World Competition?" was the challenging title of the opening address by Swan E. Bergstrom, president of the Association, and vice-president of the Cincinnati Milling Machine Co., Cincinnati, Ohio. In acknowledging the fact that many good foreign machine tools now compete with American machine tools, both in the United States and in the rest of the world, he reviewed the origin of that situation: the appalling shortages of domestic machine tools at the start of the Korean War, and America's commitments of economic aid to the free world.

Continuing on this problem of the industry, Mr. Bergstrom said, "Due to our defense program and that of Great Britain and France, the machine tool industries in Western Europe have been able to build themselves up to a point where they are today a challenge for the world markets. These industries have been built up in new buildings, with new production facilities, and with new designs, during a period when our own industry has been working over capacity building equipment for our own national defense. . . .

"How are all of these machine tool builders in West Germany, France, Italy, and England going to be able to exist? They'll only exist if they trap the world markets. Germany, prior to World War II, dominated the machine tool market in Eastern Europe, the Near East, and the Far East, as well as Latin America. Today, Eastern Europe, the Near East, and the Far East are shut off from her world market. To exist, she must open new markets with more intensified selling in Western Europe, Latin America, India, Canada, and the United States."

Voicing his optimism that the American machine tool industry can retain its present world leadership, Mr. Bergstrom proposed that (1) the industry do a diligent job of research, development, and engineering that will place it so far in the lead that the American machine tool will command the premium in price that it will have to have in order to exist in the world markets; (2) the industry work closely with Government agencies to provide them with the information that will enable them realistically to appraise the importance of machine tools to the national welfare; (3) the industry produce an aggressive selling organization; and (4) the industry concentrate its efforts on tapping the replacement market.

Tell Berna, in submitting his report as general manager of the Association, stressed the importance of training the machine tool executives of



The newly elected officers of the National Machine Tool Builders' Association are (left to right) president, Herbert L. Tigges; first vice-president, Milburn A. Hollengreen; and second vice-president and director, Louis Polk.

Present Selling Problems

tomorrow in the machine tool shops of today. Mr. Berna went on to caution the builders to protect their operations from enemy attack or natural disasters by training and alerting plant personnel, setting up stand-by power units and walkie-talkie equipment, and by microfilming all engineering drawings, as well as drawings of the plant itself.

Favorable progress being made by the Association's Sub-Committee on Procurement Policy was described in the report of the chairman, Herbert L. Tigges, executive vice-president, Baker Bros., Inc., Toledo, Ohio. Initial discussions with Defense Department officials, stated Mr. Tigges, have gone far toward obtaining a standard contract form for machine tool procurement. Proposals made by the sub-committee are that the "Able Modified" escalation clause on an optional basis, and that an optional progress payment clause, be included. Another clause suggested for the contract would cover collateral specifications relating to electrical installations, painting, packaging, and operating manuals.

As guest speaker at the annual dinner, Arthur S. Flemming, Director, Office of Defense Mobilization, reaffirmed the determination of the present administration to develop and maintain a broad and strong mobilization base. Stating categorically the ODM's belief that a healthy machine tool industry is the cornerstone of the mobilization base program, Mr. Flemming also went on to say "We must, to the maximum extent possible, make provision prior to M-Day for the long lead-time equipment and facilities that are required in full mobilization."

Ralph J. Kraut, chairman of the Association's Sub-Committee on Overseas Markets, and president and general manager of the Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., delivered his paper on "Foreign Competition at Home and Abroad," suggesting that N.M.T.B.A. members participate in the Fourth European Machine Tool Exhibition, scheduled for Milan, Italy, in September, 1954. Mr. Kraut presented illuminating statistics on exports of machine tools for the period 1918 to 1952.

Reasons for resisting the leasing of government-owned machine tools were propounded in the report of Ralph S. Howe, chairman of the Association's Sub-Committee on Permanent Defense Capacity, and executive vice-president, New Britain Machine Co., New Britain, Conn. "One sound reason," Mr. Howe contended, "is the obvious upsetting of the present competitive position of manufacturers in the metal-working field. Government leasing of equipment places the Government in business, and in effect replaces private venture capital which, under our way of life, is supplied by stockholders."

Lloyd D. McDonald, chairman of the Association's Sub-Committee on Tax Policy, and executive vice-president of the Warner & Swasey Co.,







Also elected at the annual meeting of the Association were John C. Cotner (left), treasurer; and William E. Rutz and Everett M. Hicks (center and right), directors.

Cleveland, Ohio, claimed both Congressional and Treasury Department support for tax reform provisions in regard to depreciation provisions advanced by the N.M.T.B.A.

In the absence of William L. Dolle, chairman of the Committee on Public Relations, and president, Lodge & Shipley Co., Cincinnati, Ohio, his paper entitled "Six Working Tools for Community Relations" was presented by Mr. Berna. The six tools alluded to are six pieces of literature sponsored by the Association: "America's Muscles," a simple, non-technical booklet; "Machine Tools Today," a booklet for distribution to educational institutions and libraries; "Machine Tool Progress," a bulletin for trade paper editors and financial editors of newspapers; "Key to Survival and Growth," for metal-working executives and buyers; "Careers in the Machine Tool Industry," for young men and women interested in job opportunities; and finally, "Proposals for Tax Revision," a booklet for presentation to Congressmen and Senators.

Perrin G. March, III, assistant administrator, Business and Defense Services Administration, spoke on "The New Department of Commerce." Mr. March pledged the Department's efforts to vigorously represent the business point of view in Government. He stated that Congress recognized the necessity of continuing certain activities under the Defense Production Act. Some of these activities that are being handled by the Metal-Working Equipment Division are the administration of priorities, recommendations to ODM on tax amortization cases and to GSA on facilities contracts, and work on mobilization planning and post-attack production planning.

"Use it or Lose it!" proved to be a stimulating and inspiring talk on proper selling approaches. It was given by Arthur Harrison Motley, president, Parade Publications, Inc., New York City.

Mr. Tigges was elected president of the Association. Milburn A. Hollengreen, president and general manager, Landis Tool Co., Waynesboro, Pa., was elected first vice-president; Louis Polk, president of the Sheffield Corporation, Dayton, Ohio, was elected second vice-president and director; and John C. Cotner, president and general manager, Hydraulic Press Mfg. Co., Mount Gilead, Ohio, was elected treasurer.

New directors elected, in addition to Mr. Polk, were Everett M. Hicks, vice-president and manager of the Grinding Machine Division, Norton Co., Worcester, Mass.; and William E. Rutz, executive vice-president and works manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. Tell Berna was reappointed general manager of the Association, and Mrs. Frida F. Selbert, secretary.

Chip Breaking Research Report and Wall Chart Available

Publication of a research report "Chip Breaking," consisting of a study of three-dimensional chip flow, has been announced by James C. Hebert, general sales manager of the Jones & Lamson Machine Co., Springfield, Vt., who is chairman of the committee in charge of this research program. This project is the first known attempt to determine what dimensions control the form of the chip, to suggest the best angles of rake and clearance, and to give the tool-room a simple rule that will insure optimum results both as to form of chip and tool life for cuts in various grades of steel.

The report, printed in booklet form, is the result of a research project conducted during the last two years at the Sibley School of Mechanical Engineering of Cornell University by Professor Erik K. Henriksen of the Department of Materials Processing, under the general supervision of Director Harry J. Loberg of the College of Engineering. The findings given in the booklet are primarily applicable to turning operations. They apply equally well to engine lathes, automatic lathes, turret lathes, boring mills, and automatic bar machines, but will also be helpful on cutting operations such as planing, and shaping.

The research project which resulted in the publication of the booklet was jointly undertaken by a number of machine tool companies under the auspices of the National Machine Tool Builders' Association. The Steering Committee directly responsible for the research work consisted, in addition to Mr. Hebert, of the following: Frank U. Hayes, vice-president, Bullard Co., Bridgeport, Conn.; J. Herbert Myers, vice-president, machine tool sales, Lodge & Shipley Co., Cincinnati, Ohio; Stanley A. Brandenburg, vice-president in charge of sales, Monarch Machine Tool Co., Sidney, Ohio; Donald M. Pattison, vice-president–sales, Warner & Swasey Co., Cleveland, Ohio; and Harold R. LeBlond, president, Cleveland Automatic Machine Co., Cincinnati, Ohio.

The following machine tool companies, in addition to those represented on the Steering Committee, participated in defraying the cost of the research project:

American Steel Foundries, King Machine Tool Division, Cincinnati, Ohio
American Tool Works Co., Cincinnati, Ohio
Axelson Mfg. Co., Los Angeles, Calif.
Baldwin-Lima-Hamilton Corporation, Niles Tool Works Division, Hamilton, Ohio
Cincinnati Lathe & Tool Co., Cincinnati, Ohio

Consolidated Machine Tool Corporation, Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gisholt Machine Co., Madison, Wis.
George Gorton Machine Co., Racine, Wis.
Greenlee Bros. & Co., Rockford, Ill.
Hendey Machine Co., Inc., Torrington, Conn.
R. K. LeBlond Machine Tool Co., Cincinnati, Ohio
Lipe-Rollway Corporation, Syracuse, N. Y.
Oster Mfg. Co., Cleveland, Ohio
Potter & Johnston Co., Division of Niles-Bement-Pond Co., Pawtucket, R. I.
Pratt & Whitney Division, Niles-Bement-Pond Co., Hartford, Conn.
Seneca Falls Machine Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio
Springfield Machine Tool Co., Springfield, Ohio
Sundstrand Machine Tool Co., Rockford, Ill.
Wickes Brothers, Saginaw, Mich.

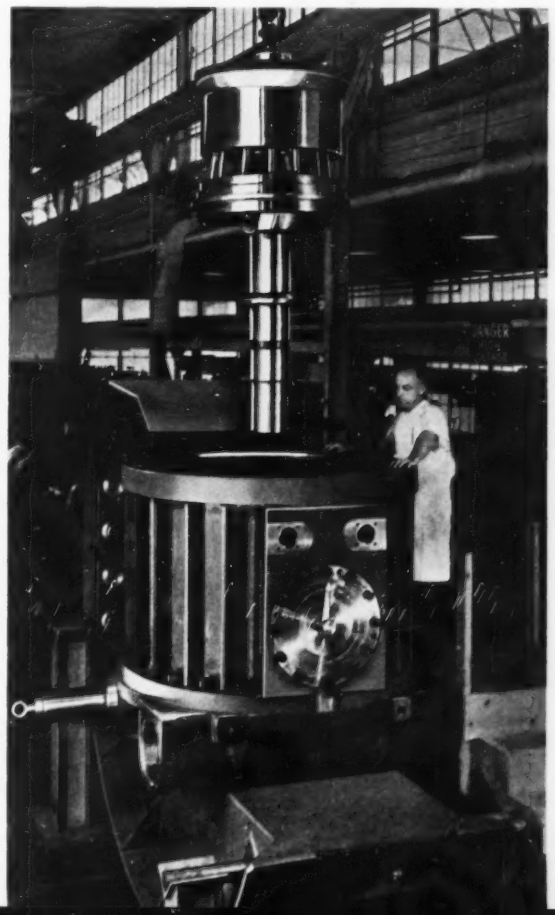
In addition to the report itself, the Steering Committee has prepared a wall chart that can be hung in tool-rooms in order to give the men who grind carbide tools simple and clear directions on the optimum shape of the tool, including angles of rake and clearance and the dimensions of the chip-breaker. In a preliminary test of these findings by a large Detroit company, the number of pieces produced per grind of the tool was in some cases doubled and in others more than doubled, in combination with a very satisfactory chip formation. Copies of the report and of the wall chart may be secured from any of the sponsoring machine tool companies.

Huge Oil Hydraulic Pumps for Tube Reducers

A PAIR of heavy-duty oil hydraulic pumps, each capable of transmitting up to 4000 H.P. at a pressure of 3000 pounds per square inch, were recently completed for the Tube Reducing Corporation, Wallington, N. J. The pumps, weighing more than 20 tons each, were designed and constructed by Waterbury Tool, Division of Vickers Inc., Waterbury, Conn., for the drive systems of what are claimed to be the world's largest tube reducers. Two of these reducers are being constructed by the E. W. Bliss Co. Ingoing tubes ranging from 18 to 10 inches in outside diameter will be reduced to diameters of 17 to 9 inches.

In spite of the large size of many parts of the pumps, the tolerances are substantially the same as on smaller units in order to provide efficient metal-to-metal sealing against high oil pressures. The machining accuracies required on the large components posed some difficult manufacturing problems. Full-size wooden models of the main shaft, universal joint, and tilt box assembly were made so as to be certain of clearances.

The size and weight of many of the parts presented material-handling problems not ordinarily encountered in hydraulic pump manufacture. Some parts of the pump had to be assembled with the axis of the outer case in a vertical position, while other parts required that the case be in a horizontal position. It proved necessary to build a special rocker cradle, referred to in the shops of Waterbury Tool as the "rocking chair," to provide a means of rolling the pump from one position to the other. The rolling is done by overhead cranes. In its vertical position, the cradle is supported in V-shaped brackets.



Assembling the rotating unit in the case of a huge hydraulic pump by employing a cradle that facilitates rolling of the case from a vertical position to its normally horizontal one

Production of Permanent Magnets in a Modern Plant

PUSH-BUTTON controlled and mechanized materials-handling innovations; advanced applications of quality control; and some unusual methods of grinding, sintering, heat-treating, and metal casting peculiar to the production of permanent magnets characterize the new Edmore, Mich., plant of the Carboloy Department of General Electric Co. When in full production, this modern plant will turn out more than 2200 different sizes and shapes of Alnico permanent magnets in volumes of hundreds of thousands per month for such applications as military electronics items and civilian products.

Permanent magnets are manufactured by two methods—casting and sintering. In the former method, by which a majority of the magnets are produced, the work is shaped from poured metal following conventional foundry casting techniques. By the latter method magnets requiring more closely controlled dimensional or higher physical properties, as well as tiny magnets weighing less than 15 grams, are produced.

Baked sand molds or core slabs are stacked about ten high and sandwiched between steel plates with a pouring cup at the top. As the molten metal is poured into the stack, Fig. 1, it is carried away by a large central sprue and distributed to all the magnet cavities in the stack. Melting is done in Ajax induction furnaces. Typical pouring temperature for the aluminum-nickel-cobalt alloys is approximately 1780 degrees C., or 3240 degrees F.

After cooling and shakeout, the magnets are cleaned by sand-blasting in Pangborn Roboblast machines or in a cabinet type sand-blasting unit. The cleaning machines are used for the smaller more regular shaped magnets. The cabinet unit is used only for large magnets requiring special handling. All flash and large casting imperfections are removed by means of disc snag grinders.

A three-step heat-treatment has been carefully developed to insure consistently high magnetic quality of Carboloy permanent magnets. The initial step of this treatment is a uniform heating to a temperature between 950 and 1350 degrees C., using box type resistance furnaces or induction type heaters. From these temperatures the magnets are quenched or cooled at a controlled rate to room temperature. A strong magnetic field is used in conjunction with the controlled cooling process to obtain superior and

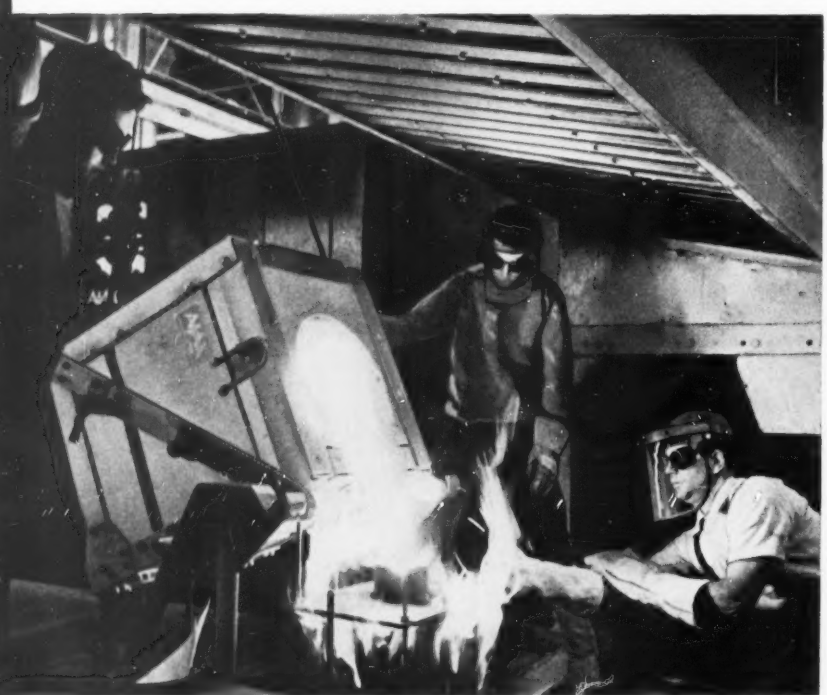


Fig. 1. Permanent magnet alloy is melted in induction furnace and poured into stack of baked sand molds or core slabs.



Fig. 2. After low-temperature aging, magnets are placed in rotary work-carrier and passed through coil for demagnetization.

directional magnetic properties in certain of the alloys. The last step of the heat-treating process is a low-temperature aging for periods of time ranging from five to ten hours in circulating furnaces.

As the magnets leave the draw furnaces they are still partly magnetized from the directionalizing heat-treatment. To simplify handling in the finish-grinding section, they must be demagnetized. Four demagnetizing machines, all built in the Edmore plant tool-room, are used along the production line. One of these machines is shown in Fig. 2. The operator merely loads the rotary wheel work-carrier and the demagnetized parts drop into tote trays.

Sintering of magnets pressed from metal powders is done in resistance-wound tube furnaces built by the General Electric Co. These furnaces have a protective hydrogen atmosphere and are capable of producing temperatures well over 1400 degrees C.

Alnico type permanent magnets have excellent magnetic qualities but they lack desirable physical properties from the standpoint of conventional machining processes. They are hard, brittle, hot-short, impractical to machine, and

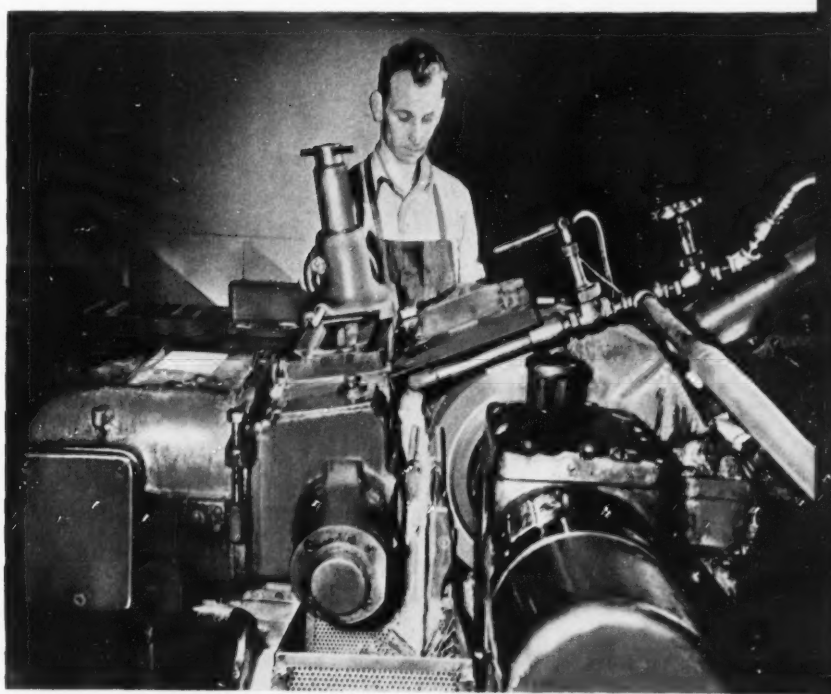


Fig. 3. Cylindrically shaped permanent magnets are reduced to the required diameter on a centerless grinding machine.

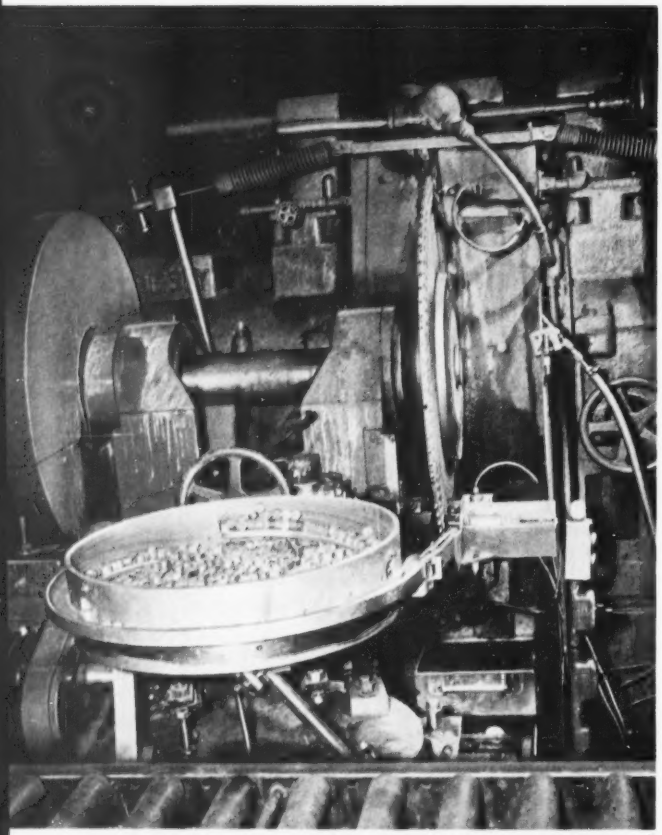


Fig. 4. Ends of magnets are finished by automatically loading fixture that carries them between opposed discs of double-spindle grinder.

difficult to grind. One of the strongest magnetic grades, for example, has a hardness of 50 Rockwell C and a tensile strength of 5000 pounds per square inch. For these reasons, the magnets are cast as close to final size as possible. Sand and graphite mold inserts are used to produce the necessary holes required in the application of the magnet. These are drilled later. Where tapped holes are required, the magnet is cast around over-size steel inserts that later are drilled and tapped.

In spite of these measures, the magnets require some finishing. Carboloy employs thirty-eight grinders, ranging from simple bench to large rotary-feed disc models. Centerless grinders, such as the Cincinnati machine seen in Fig. 3, are used to grind only cylindrically shaped magnets, with the work being fed between the two counter-rotating wheels. On the double-spindle opposed disc grinders, the work is automatically transferred from a hopper into a rotating fixture, as shown on the Besly machine in Fig. 4. The two grinding wheels rotate in opposite directions about the same axis, and the fixture carries the work between the wheels. Thus, both ends of the sand-blasted, cylindrically shaped magnets are finish-ground simultaneously. They are automatically ejected from the fixture by a plunger.

A vertical, double-spindle disc grinder, Fig. 5, is employed to finish the sides of small permanent magnets. The magnets are manually loaded in the rotary fixture on this machine.

In finishing-grinding, care is taken to avoid over-heating, checking, and cracking the work surface. A water coolant allows disk and centerless grinders to remove over 0.010 inch per pass. The surface grinders are limited to a stock removal of from 0.001 to 0.002 inch per pass. Wheel selection is important, as hard wheels overheat and "burn" the magnet, while the wear of soft wheels may result in inaccurate parts.

The final step in processing Alnico magnets is magnetic test and inspection. Although the magnets are inspected and tested at several stations in the manufacturing process, they are given a thorough final check before being sent to the shipping department. In the inspection area, the magnets are first cleaned in a Detrex machine, being carried through this machine on a belt conveyor and sprayed with hot cleaning solutions to remove all grease and foreign material.



Fig. 5. Sides of small permanent magnets are finished to size on this vertical, double-spindle disc grinder. Magnets are manually loaded in rotary fixture.

TOOL ENGINEERING *Ideas*

Tools and fixtures of unusual design and time- and labor-saving methods that have been found useful by men engaged in tool design and shop work

Hand-Operated Radius Milling Fixture

By W. M. HALLIDAY, Birkdale, Southport, England

A pin with a rectangular head on which unusual radius milling operations must be performed is shown in Fig. 1. The cylindrical shank *A* of this pin is turned to a diameter of 5/8 inch within close limits, and the rectangular head *B* at one end of the shank is surface-ground to close tolerances on all sides except the one joined to the shank. The two slots *C*, identical in width and depth, are machined in the top of the head portion by straddle-milling cutters. The center axis of each slot is exactly in line with the main axis of the shank. Both slots are located at right angles to the long sides of the head. The part is made of free-cutting brass.

All dimensions of the two slots must be held to limits of plus or minus 0.002 inch. The bottoms of slots *D* are accurately milled to a radius *E* of 3 inches. The 1/4-inch wide crest *F* is machined to a radius *G* of 3 1/4 inches from the same center.

The quantity of these components to be made, although large enough to necessitate a special holding fixture, did not warrant the production of an elaborate device. The diagrams, Figs. 2 and 3, show the simple but effective milling fixture developed. Although this fixture is designed for hand operation, the short length of the cut taken, and the rapidity with which the parts can be loaded, machined, and unloaded, make it possible to obtain an economical production speed.

The under side of the fixture body *H* is machined for mounting on the milling machine table. A swinging arm member *I* is slotted at its lower end for a close fit over boss *J*. A minimum of side clearance is allowed between these members. The arm is pivoted on the hardened headed steel stud *K*. Thus mounted, the arm should have a certain amount of swiveling movement each side of the vertical axis of the fixture.

Stud *L* is screwed tightly into the right-hand side of the arm and fitted over it is a slotted steel shackle formed integrally on the end of the cylindrical rod *M*. The shackle and stud are connected by a pivot-pin.

At the right-hand end of body *H* is an upright column with a rectangular slot machined completely through it in line with the axis of stud *L* when arm *I* is in the vertical position. Inserted in this slot is a hardened steel rectangular block *N*, which is made a close sliding fit between the front and rear vertical sides of the slot. An ample amount of clearance should be provided between the top and bottom sides of the slot and the block in order to permit the latter member to swivel.

Block *N* is pivoted on a pair of headed pins *O* which are located one at each side of the column on the same centers in both vertical and horizontal planes. The pins are retained in the column by headless screws. Block *N* is bored lengthwise to be a sliding fit over the rod *M*, and the pivot-pins *O* project into the sides of the block only a sufficient amount to prevent interference with the sliding movements of the rod.

Rod *M* is threaded to take aluminum handwheel *P*, the boss of which bears against the end of block *N*. A compression spring encircles the rod between block *N* and the shackle at the end of

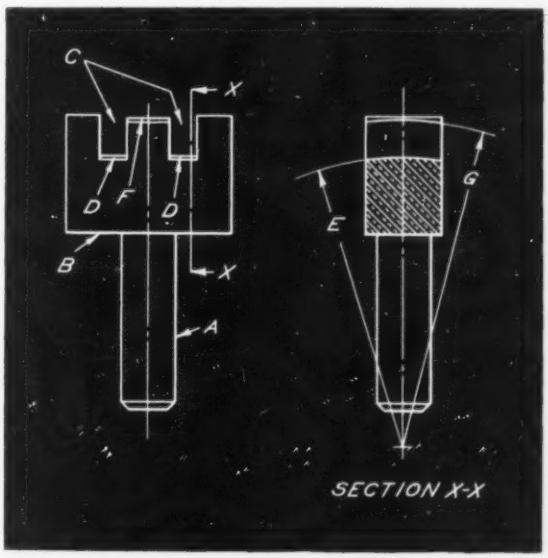


Fig. 1. Component in which slots (C) are milled by use of fixture shown in Figs. 2 and 3

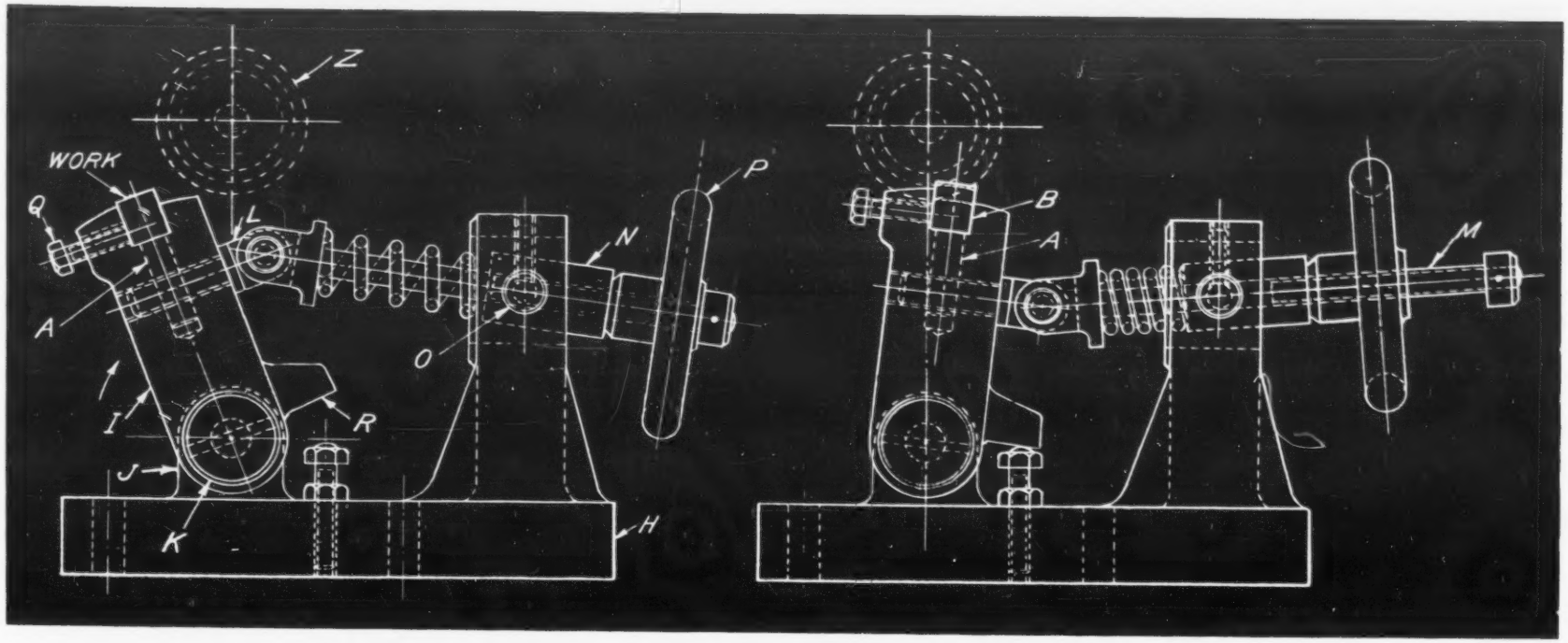


Fig. 2. Views of fixture used to mill slots (C), Fig. 1, showing arm (I) in starting and finishing positions

rod *M*, to hold the handwheel tightly against the block, and force arm *I* to turn in a counterclockwise direction when the handwheel is released. To restrict the adjusting movements of the handwheel on the threaded end of rod *M*, a small collar is fastened to the right-hand end of the rod.

A rectangular slot extends across the upper end of arm *I* to receive head *B* of the work. The center of this slot coincides with the center axis of the arm passing through the pivotal point on stud *K*. The width of the slot is made about 0.002 inch greater than that of the rectangular head of the component to be milled. The depth of this slot is less than the height of the workpiece head to allow clearance for the milling cutters used to form the slots. Two reamed holes 5/16 inch in diameter in the base of the slot receive the cylindrical shank of the work.

The fixture is designed to take two components at each setting, these being mounted side by side in the slot in arm *I*, as shown in Fig. 3. Engagement of the shank portions within the holes in the bottom of the slot insures accurate location of the parts in crosswise relationship to the cutters, while the sides of the slot will insure that the rectangular head portions are positioned at right angles to the cutters.

The base of the slot must be exactly parallel with the axis of fulcrum stud *K* and the machined base of body *H* when the arm is mounted in the working position, as shown. Each component is retained in the correct position in the arm by a set-screw.

To control the amount of swiveling movement imparted to arm *I*, this member is provided with a lug *R* on the right-hand side. This lug bears on the rounded head of a hardened stop-screw in a tapped hole in body *H*.

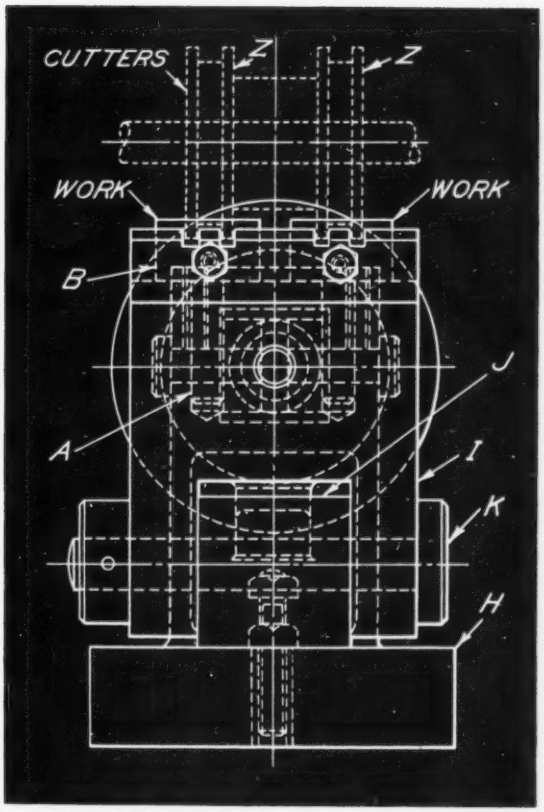


Fig. 3. End view of milling fixture shown in Fig. 1

After the fixture is fastened to the milling machine table, the table and cross-slides are adjusted so that the center of fulcrum pin *K* lies exactly on the vertical axis passing through the milling cutters on the arbor, and with the cutters in the correct transverse position relative to the length of the heads. All slides and the table of the machine are then locked. The slots are machined by swinging arm *I*.

When the slots have been machined halfway through, arm *I* will have reached the middle vertical position perpendicular with the base. Slots *C* (Fig. 1) are machined by the pair of cutters *Z*, Fig. 3 mounted on the arbor of the milling machine. These cutters are spaced 1/4 inch apart. The cutters form the narrow 1/8-inch wide slots, and also produce the arc at the base of each slot. A third cutter, of smaller diameter, is mounted between cutters *Z* to produce the curved crest *F* of the head.

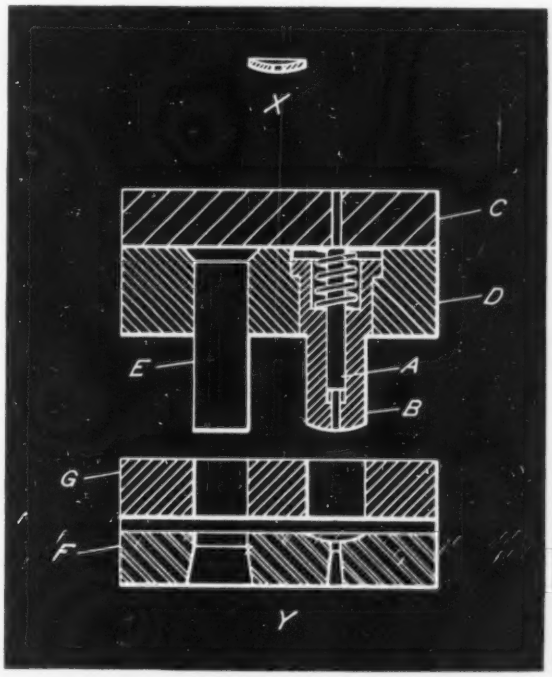
The cutters revolve in a clockwise direction and operation of the fixture commences from the position shown at the left, Fig. 2. In this starting and loading position, arm *I* has been swiveled counter-clockwise to bring the work-pieces clear of the cutters. This position will be determined by the stop-collar at the right-hand end of rod *M* which makes contact with the boss on the handwheel. As the handwheel is rotated in a clockwise direction, rod *M* will be drawn gradually through the block *N*, and at the same time arm *I* will be slowly swiveled toward the right about pin *K*. This hand-operated movement is continued until the head *B* of the pin has been completely traversed by the cutters, and the final stop position is reached when lug *R* bears against the stop-screw in base *H*, as seen in view at right Fig. 2.

The threads on rod *M* should be of fine pitch to permit a suitable rate of feed of the work past the cutters. As arm *I* undergoes the swiveling movement, the shackle connection allows rod *M* to adjust itself radially to suit the angularity of the arm at all points throughout its working range. The base of the slot in the end of arm *I*, which receives head *B* of the work, should be located the exact distance away from the center of the fulcrum stud so that the necessary radius will be obtained on the bases of the two slots.

Piercing and Embossing in One Station of a Progressive Die

By Federico Strasser, Santiago, Chile

A progressive type die has been designed for the production of parts similar to the dish-shaped part shown at *X* in the illustration, in which the embossing (shallow drawing) and piercing



Die for simultaneously piercing and embossing small part

operations are combined in one station. The piercing punch *A* is housed within the embossing punch *B* and is solidly secured to the punch-holder head *C* as seen at *Y* in the illustration. A sliding fit is required between the embossing and piercing punches, and also between the embossing punch and the punch-holder plate *D*. A compression spring holds the embossing punch in its downward position so that it contacts the work before the piercing punch can come into action.

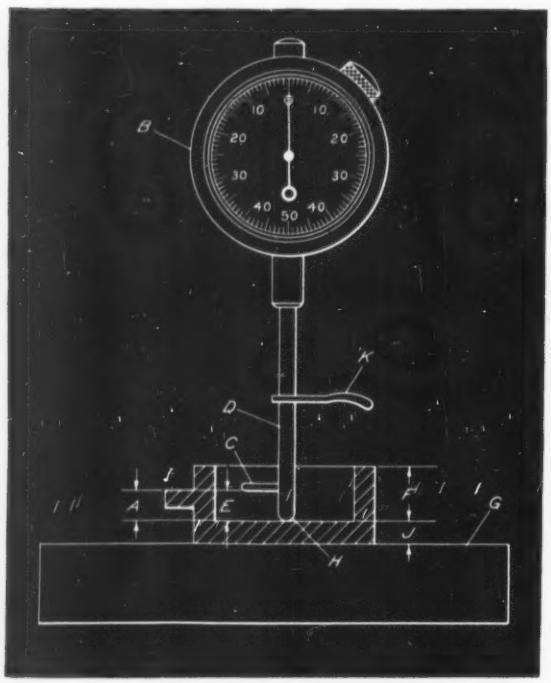
In operation, the embossing punch recedes upon contact with the work until it reaches a stop formed by the punch-holder head. At this time, the piercing punch is extended and both the embossing and piercing operation are effected simultaneously. The work-piece is then fed to the next station at the left, where a blanking operation is performed in the normal manner. The blanking punch, die, and stripper, *E*, *F*, and *G*, respectively, are of conventional design.

Dies of similar design may be applied for deep-drawing and other related operations involving the piercing of a hole.

Indicator that Gages External Height from an Internal Surface

By Kurt H. Steenburgh, Schenectady, N. Y.

Direct tolerance readings of nominal dimensions between internal and external points may be conveniently taken by means of a dial indicator which is fitted with a special gaging pin and lift arm, as illustrated. Distance *A*, from the bottom of the counterbore to the top of an external projection, is to be gaged. This is accomplished by means of pin *C* which is secured to an extension tip *D* of the dial indicator *B*. The bottom of pin *C* is ground so that distance *E* is equal to the nominal dimension *A*. An indicator with a travel greater than distance *F* must be used to permit the tip to clear the work-piece without disturbing the indicator. The dial indicator is mounted on a stand so that it is always at the same height above the surface plate.



Conventional indicator modified for rapid gaging of dimension from external projection to bottom of cavity

In operation, the part to be checked is placed on a surface plate *G*, and rounded point *H* of the extension tip is allowed to rest on the bottom of the cavity. The indicator bezel is then set to zero. By setting the indicator for each part checked, any variation in thickness *J* is compensated for.

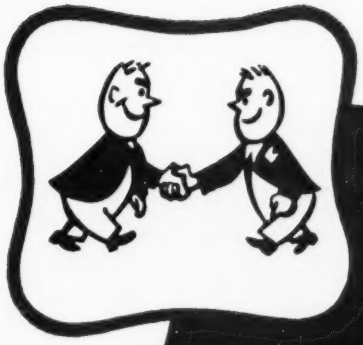
Arm *K* is next lifted to raise the indicator tip out of the cavity, and the work-piece is moved sidewise to allow the pin to rest on the external projection to be checked. Any discrepancy in distance *A* may then be read directly from the indicator dial. Several pins may be attached to the extension tip for checking a number of dimensions in one setting.

* * *

Secrets of Metals Now Revealed

The innermost secrets of metals can now be revealed by electronic magic with new engineering tools introduced by the North American Philips Co., Inc., Mount Vernon, N. Y. An electron microscope and an X-ray diffractometer and spectrograph prove useful for solving problems concerned with metal phases, structure, hardening and annealing control, and also with corrosion, drawing, and spinning. The electron microscope, with 100 kilovolts of power, magnifies an object up to 60,000 times its actual size so that it is now possible to examine the minutest structural details of a metal surface.

The X-ray diffractometer and spectrograph literally fingerprint the "innards" of a substance. The diffractometer gives answers in terms of atomic identities and physical arrangements, while the spectrograph identifies elements and totalizes the quantities of each. These instruments are used widely in industry today for process control, because data is available in a matter of minutes, without destroying or changing the specimen in any way.



The Sales Engineer and His Problems

By BERNARD LESTER
Management Consulting Engineer
New York

Christmas Giving

RIGHT now you are probably thinking, like most other sales engineers, of Cnristmas presents for prospects and customers.

Here is the simplest formula of all. Just prepare a list of names and addresses. Pass it to your office assistant. Ask her to select the kind of gift—cigars, refreshments, cigarette lighters, golf balls, mechanical pencils. She will attend to the rest, and you won't have to worry. What could be a simpler way to complete the chore, and less expensive for the corporation in high tax brackets?

This is not the method we recommend, because it is a "slide rule" method of giving to express good will. The slide rule is a mechanical device to escape both thought and time in handling figures. Devoid of feeling and free from sensibility, it is not the tool to use in planning remembrances.

Emerson once said, "The only gift is a portion of thyself." Although the thought was certainly not intended to be interpreted literally, one sales engineer came pretty close to doing just that last Christmas. Knowing that a friend of his had a son who was wounded in Korea, he stepped around to the local blood bank and gave a pint of blood as his share toward easing the anxiety of the moment. His gift was a token never to be forgotten, because it was a thoughtful and generous act.

Of course Emerson meant that true giving only springs from thought and action peculiar to oneself. The question for each sales engineer motivated by good will is how best to express it. Only those expressions of good will, irrespective of monetary value, can possibly ring true as they individualize the feelings of both giver and recipient.

Christmas giving should be personal and individual. Any gift should be fashioned to the character, individual traits, and mood of the recipient to be really meaningful. It might well be an appropriately selected gift bearing a thought message on the part of the giver.

Even in the case of a Christmas card, how much more each greeting means if individualized by a signature or short written message! The recipient's feelings are touched in a way impossible to be reached by mere printer or mailing clerk.

We have always advocated gifts of moderate price and of personal significance. They should be considerately selected, and packaged in wrappings of good will. So handled, they are in the spirit of Christmas. Giving in this way makes life richer—in fact, it's lots of fun!

* * *

Harder Gears for Big Ships

A major improvement has been made in the method of hardening rims of large gear wheels used on heavily powered vessels. High hardness can be obtained easily on smaller wheels, but vessels like the *U.S.S. Forrestal* require bull gears with single-piece forged rims more than 13 feet in diameter, having built-up centers. Such wheels are fabricated by arc-welding and then stress-relieved, with a subsequent reduction in hardness.

The Westinghouse Electric Corporation, Pittsburgh, Pa., has developed new techniques using low-hydrogen electrodes that give sound welds with molybdenum-vanadium steels. These techniques have resulted in hardnesses of the tooth surfaces between 223 and 260 Brinell. The usual range is between 160 and 190. The advantages of harder rims are less wear and less pitting at higher tooth loadings.

LATEST DEVELOPMENTS IN *Shop*

Onsrud High-Speed Fast-Feed Profile-Milling Machine for Non-Ferrous Metals

The Onsrud Machine Works, Inc., Dept. M, 3940 Palmer St., Chicago 47, Ill., is introducing to the metal-working industry an A-42 high-speed, fast-feed profile-milling machine that is said to have a tremendous capacity for the production of parts made from aluminum and other non-ferrous metals. An outstanding feature of the machine is the coordinated tri-directional feed system that makes possible milling to any profile or contour line without slowing up the feed at any point. In this system, rotary InvOmil power-feeding of the cutter-head is automatically combined with transverse and longitudinal feeding of the table for milling along any desired profile line. Coordination of the feeding movements is electronically maintained and the machine operator directs the feed travel by two hand controls.

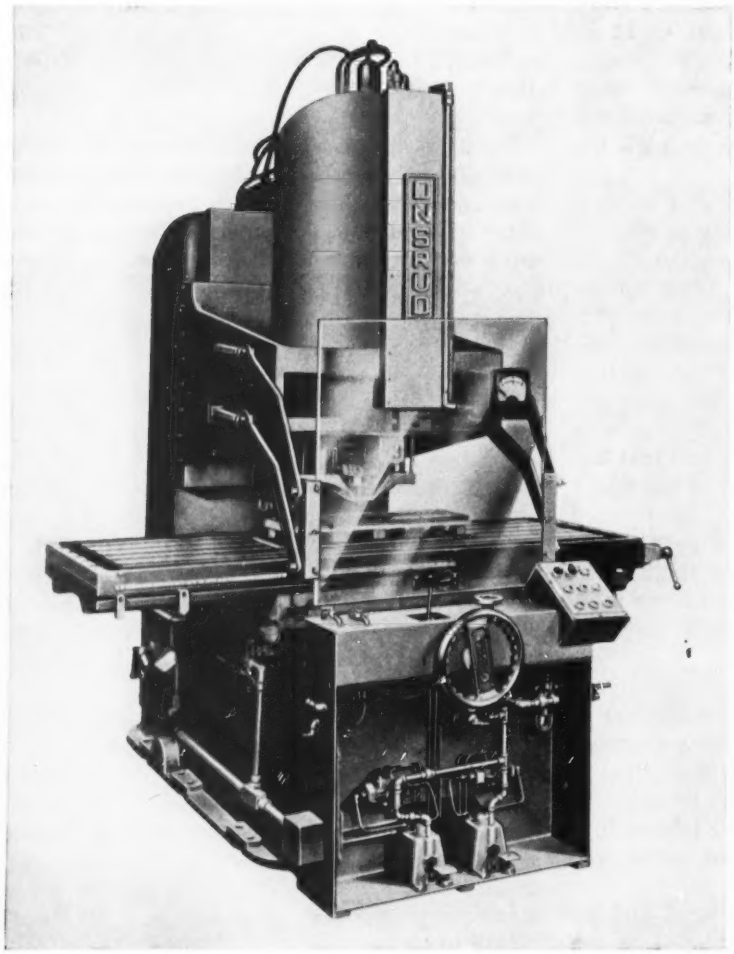


Fig. 1. High-speed profile-milling machine for non-ferrous metal work brought out by the Onsrud Machine Works, Inc.

A template positioned above the work-piece controls the operation of the machine when profile-milling. The cutter-head assembly includes a follower, and the operator employs hand controls to maintain contact between follower and template during the milling cut. The follower and cutter are held in their proper positions by a pneumatic pressure device known as the "Pneumatic Compensator." The pneumatic cylinder is designed for a stroke of 4 inches. In effect, the operator has a positioning range of 4 inches in which the follower and cutter will be accurately located in relation to the template. As a result, control accuracy is taken care of automatically and the operator can handle the work at top milling speed.

The vertical cutter-spindle is driven directly by an Onsrud air-cooled, two-speed motor rated at 15 to 30 H.P. at 7,200 to 14,400 R.P.M. At these extremely high speeds, any feeding rate within the limits of the machine can be employed. Thus a wide variety of parts of the type shown in Fig. 2 can be machined at high production speeds with the profile-milling machine shown in Fig. 1.

The table measures 27 inches

Equipment

Machine tools, unit mechanisms, machine parts, and material-handling appliances recently placed on market

Edited by FREEMAN C. DUSTON

wide and either 80 or 98 inches long, as specified. The minimum distance from the base of the chuck to the table surface is 0.50 inch and the maximum distance 18 inches. The maximum infeed travel of the table under transverse power movement is 12 inches and the longitudinal movement with power feed is 42 inches with the 80-inch table and 60 inches with the 98-inch table.

Although designed for profile-milling, the A-42 machine will also handle straight-line milling work at equally high production rates. For this type of milling, dogs can be set to control the length of table travel in either the longitudinal or transverse direction. The ruggedly built machine has full table support. The accuracy of work produced by profile-milling is claimed to be equal to that of the template. In straight-line milling, accuracy is assured by the over-all rigidity of the machine.

The constant feed rate maintained by this machine in profile-milling serves to protect the cutter and work. It eliminates the stopping or excessive slowing down of the feed in milling a 90-degree corner at high cutter speeds. Such slowing down of the feed has been found to generate sufficient heat to cause oxidation of the aluminum surface, which instantly dulls the edge of the cutter. The A-42 profile milling machine, it is claimed, is able to maintain a constant feed in milling any type of corner or profile and thus avoid oxidation of the work and dulling of the cutter.

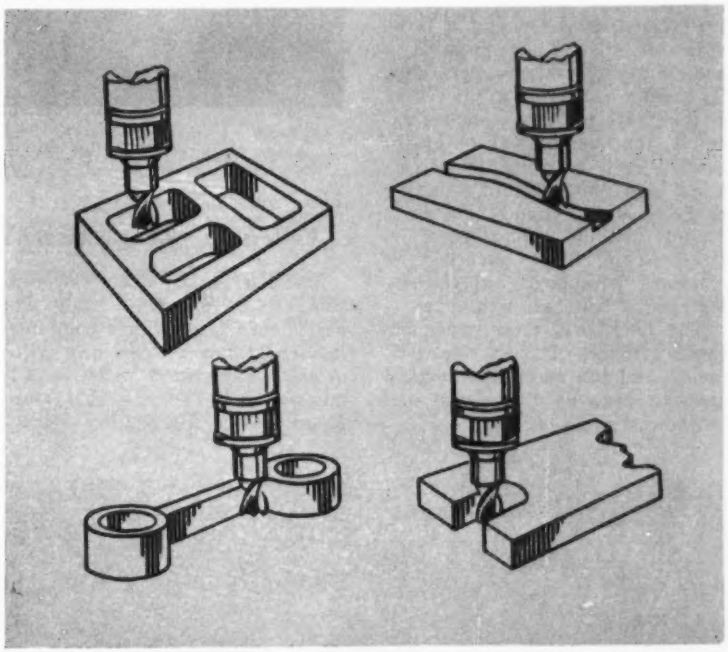


Fig. 2. Examples of profile-milling work performed on machine seen in Fig. 1

Non-Flammable Hydraulic Fluid

A non-flammable hydraulic fluid developed to combine maximum fire resistance with hydraulic efficiency is being introduced by E. F. Houghton & Co., Dept. M, 303 W. Lehigh Ave., Philadelphia 33, Pa. This fluid, known as "Houghto-Safe," is said to satisfy the need for a safe, non-toxic, non-corrosive liquid that can be used in hydraulic equipment operated near open flames or adjacent to extreme heat conditions. It is classed as a water-base, "snuffer type" material.

In exhaustive hydraulic pump tests, this fluid has shown the lubricating ability of high-grade petroleum hydraulic oils. It will not freeze and can be pumped at working temperatures down to 0 degrees F. The high oxidation stability of the fluid assures long service life. It will not attack synthetic rubber packings and has a viscosity index of 150, indicating resistance to viscosity changes at varying temperatures. Physically, it is amber-colored and extremely oily in nature.

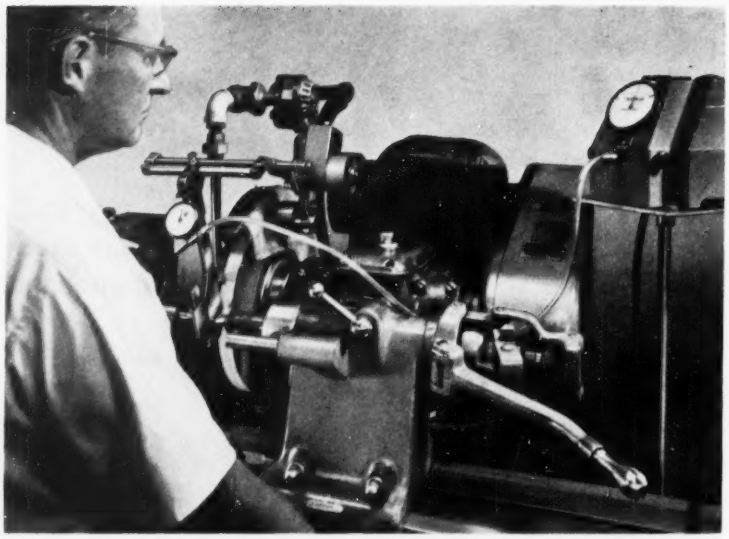
Applications include such equipment as die-casting machines, hydraulic foundry equipment, coke oven door closers, hydraulic forging presses, hydraulic glass forming equipment, ingot manipulators, fork lift trucks operating near furnaces, and hydraulic clamping fixtures of welding equipment. Laboratory and field tests show that "Houghto-Safe" fluid can be used efficiently at 1000 pounds per square inch pump pressure.

Baldwin-Emery Universal Testing Machine

A Model FGT Baldwin-Emery universal testing machine, which is said to be the first in which SR-4 resistance wire strain gages are used for load measurements, has been announced by the Baldwin-Lima-Hamilton Corporation, Dept. M, Philadelphia 42, Pa. This machine provides not only for simple tension and compression tests, but also for automatic load reversal, creep, stress relaxation, and many other tests. There are four load ranges within its 50,000-pound capacity.

Precision controls and a large indicator dial make possible a wide range of testing operations. By setting the stylus at the center of the chart for zero load, for example, the machine can be cycled automatically between any two selected load limits within a testing range of 50,000 pounds tension to 50,000 pounds compression. A stress-strain SR-4 recorder is standard equipment. Accessories for special tests are available.

The horizontal clear space between columns of the tester is 21 inches and the maximum vertical opening between the platen and cross-head is 24 inches.



Cylindrical grinder equipped with Arnoldair attachment brought out by Federal Products Corporation

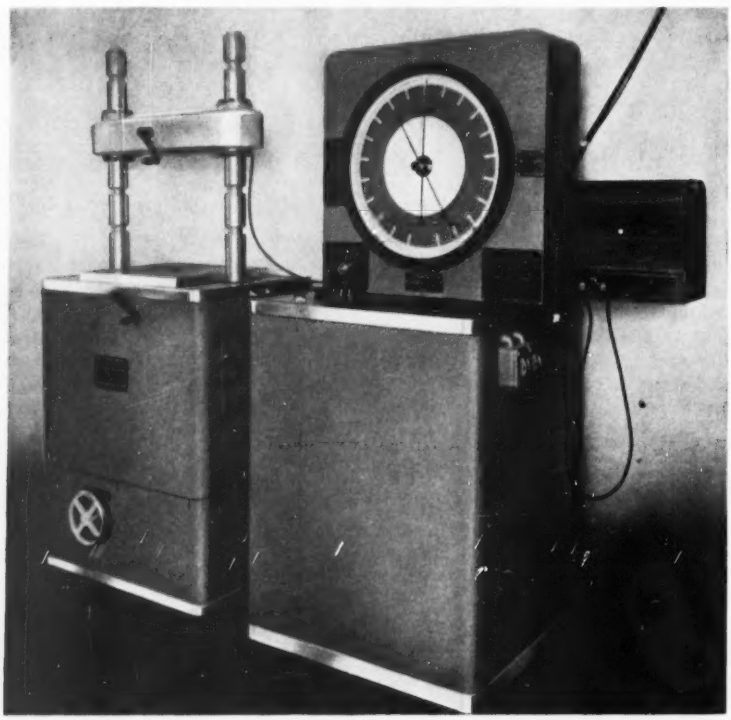
Federal Arnoldair Attachment for Cylindrical Grinders

The Federal Products Corporation, Dept. M, 1144 Eddy St., Providence 1, R. I., has combined its Arnold gage for checking cylindrical grinder work with its "Dimensionair." The resulting high-magnification air gaging attachment, called the "Arnoldair Model A-77," is said to insure production grinding of cylindrical work to remarkably close tolerances.

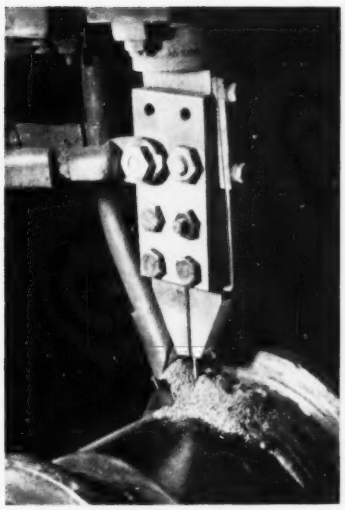
The regular Arnold gage is provided with a Federal dial indicator that contacts a plunger which rides continuously on the part. Thus the indicator shows the exact size of the part at any time during the grinding operation. Any roughness of the part, however, causes a corresponding flicker of the hand on the dial indicator, which requires close observation. The Arnoldair eliminates this flicker by cushioning the effect of the minute roughness of the work surface, enabling the operator to hold the work to closer tolerances.

The Arnoldair has made possible the grinding of large quantities of parts to size within 0.0001 inch. It is also claimed that operators find it practical to produce parts within close tolerances —0.0001 inch or less—to suit assembly needs.

The Arnoldair attachment is an extremely simple device that applies the smooth, positive magnification of the "Dimensionair" through the dial indicator. Where a large amount of stock is left for finish-grinding, the indicator gives the operator ample warning on approaching the final size to permit him to make the final infeed adjustment by watching the Arnoldair.



Universal testing machine built by Baldwin-Lima-Hamilton Corporation



Automatic hard-surfacing with flux developed by Lincoln Electric Co.

Fluxes for Automatic Hard-Surfacing

The Lincoln Electric Co., Dept. M, Cleveland 17, Ohio, has developed a radically new technique for automatic hard-surfacing in which the alloy content of the deposited metal is supplied by an agglomerated granular flux rather than by an electrode. These fluxes are an addition to the company's line of fluxes for hidden-arc welding of steel. It is now possible to apply automatic hard-surfacing with a conventional mild-steel electrode simply by substituting the new hard-surfacing flux for the mild-steel flux normally used.

Also for the first time it is possible to "tailor make" the hard-surfacing deposit. By diluting the hard-surfacing flux with mild-steel flux, any hard-surfacing properties can be exactly matched.

One hard-surfacing flux, the H-545, is for use whenever a smooth layer of good abrasion resistance and high impact strength is required. This flux can be used for deposits on work to be forged, such as plowshare blanks; for deposits intended to withstand metal-to-metal wear, such as tractor rollers or crane wheels; and for smooth deposits without porosity and underbead cracking, such as steel mill roughing rolls that do not require machining. The H-545 weld metal is an alloy of carbon, manganese, silicon, chromium, molybdenum, and vanadium.

The H-550 flux is used for extremely abrasion-resistant deposits with good impact strength, such as required for crusher rolls, crusher liners, and scraper blades. The H-550 weld metal is an alloy of carbon, manganese, silicon, chromium, and molybdenum.

Both of the new hard-surfacing fluxes can be used with medium- or high-carbon electrodes as well as with mild steel electrodes. Changing the electrode core wire and varying the flux mixture extend still further the range of service requirements that can be met. These fluxes are available in 100-pound bags, and the electrodes are obtainable from the company in sizes from 7/32 to 3/16 inch.

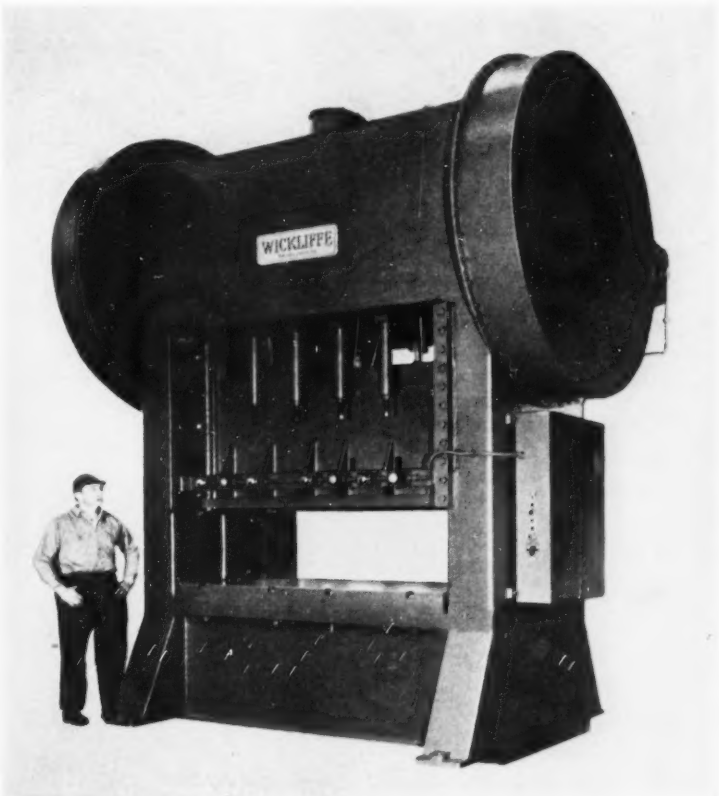
Wickliffe Line of Heavy Mechanically Operated Presses

The Cleveland Crane & Engineering Co., Dept. M, Wickliffe, Ohio, has announced a line of Wickliffe heavy presses ranging from 160 tons capacity upward. These presses will supplement the company's "Steelweld" bending press and shear lines. The new presses are intended for forming, blanking, piercing, trimming, light embossing, and drawing operations on high-speed production runs.

The single-action, straight-side, double-crank mechanical press shown in the illustration has a rated capacity of 245 tons. The bed is 48 by 84 inches and is equipped with air cushions. This press is 140 inches wide, 103 inches deep, and 174 inches high above the floor.

The air-operated clutch and brake of the Wickliffe presses are especially developed for heavy service. They are designed to operate smoothly for long periods of time without the need of frequent adjustment. The rivetless type linings are designed for extra long wear, and can be easily replaced without removing the clutch or brake from the machine.

Full control of the press during any part of the stroke is obtained by means of push-buttons. Adjustment of the slide is similarly controlled. All rotating parts are outside the operator's normal reach and all gearing is fully enclosed.



Wickliffe single-action double-crank mechanical press

Gray Special Skin Milling Machines Developed for Jet Aircraft Industry

A series of special skin milling machines has been developed by the G. A. Gray Co., Dept. M, 3611 Woodburn Ave., Cincinnati 7, Ohio, for use in the production of high-speed jet aircraft. One of the machines in this series, an 84-inch by 42-inch by 24-foot unit, was recently delivered to North American Aviation, Inc., Los Angeles, Calif. The heads and operating controls of one of these machines are shown in the illustration.

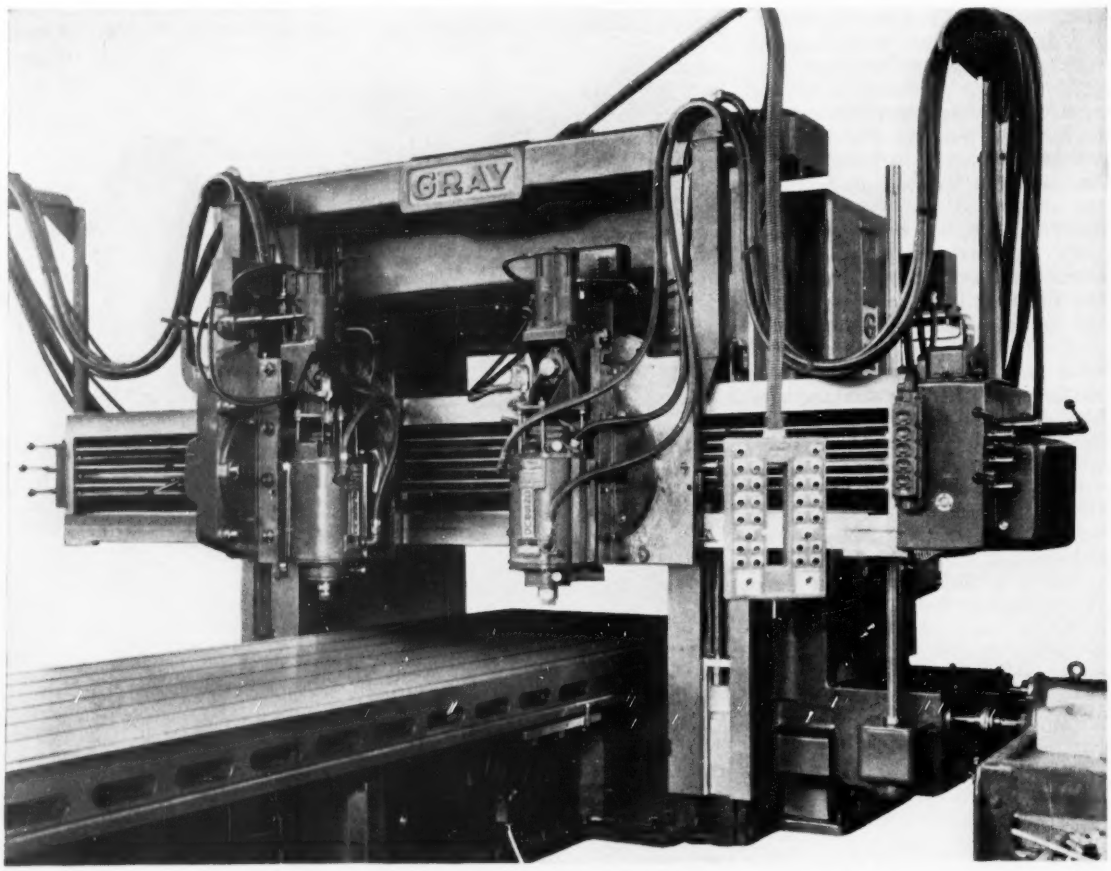
The largest of these skin milling machines thus far built is 22 feet wide by 67 feet long. It has two 50-H.P., 3450-R.P.M. Onsrud heads. Both rail heads swivel 20 degrees to either side of the vertical position. The left-hand rail head also has provision for an additional movement of 15 degrees front to back, either side of the vertical position. Instantaneous quill retraction of 1 1/2 inches is obtained by means of a pneumatically controlled device. Micrometer adjustment permits accurate repositioning of the quills. A 4-inch over-all vertical adjustment of the heads is permissible.

Because of the recurrence of certain specific angle-milling requirements, positive gear combinations are furnished to insure accurate automatic synchronization of the head and table movements in machining duplicate parts. A special pendant control station, mounted on anti-friction bearings and counterbalanced, segregates the table and head movement controls. A pendant control station is provided for starting and stopping, reversing, and changing the speed of the separate feeding motors. This equipment provides for complete steering control of the work. Table feeds range from 0.7 inch up to 180 inches per minute.

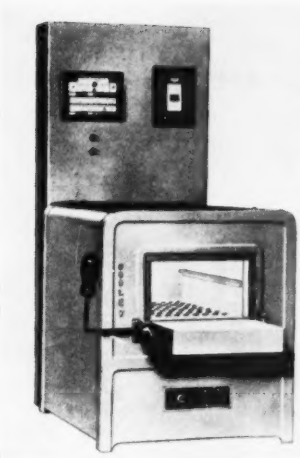
One feature of the machine is its unusually simple control. There are no metal-to-metal sliding bearing contacts, since the new Gray non-metallic table, saddle, and rail and gib bearings are employed throughout the machine. Aircraft wings and other structural sections can be milled from solid aluminum plates up to 4 inches thick on these machines. Single-tooth cutters are mounted on the spindle which has a speed of 3450 R.P.M. The large aluminum plates are held in place by vacuum chucks mounted on the machine table. Provision is made for securing full-size templates to the machine. With the pendant station control, the operator can steer the machine so as to closely follow the template and thus generate the wide variety of shapes required.

Furnace for Batch Heat-Treating of Aluminum Rivets

The Cooley Electric Mfg. Corporation, Dept. M, 38 S. Shelby St., Indianapolis 7, Ind., is now offering its Model ACH and Mod-



Close-up view of the heads and operating control of skin milling machines developed by the G. A. Gray Co. for jet aircraft production



Cooley recirculating air draw furnace adaptable to uniform heat-treating of aluminum rivets

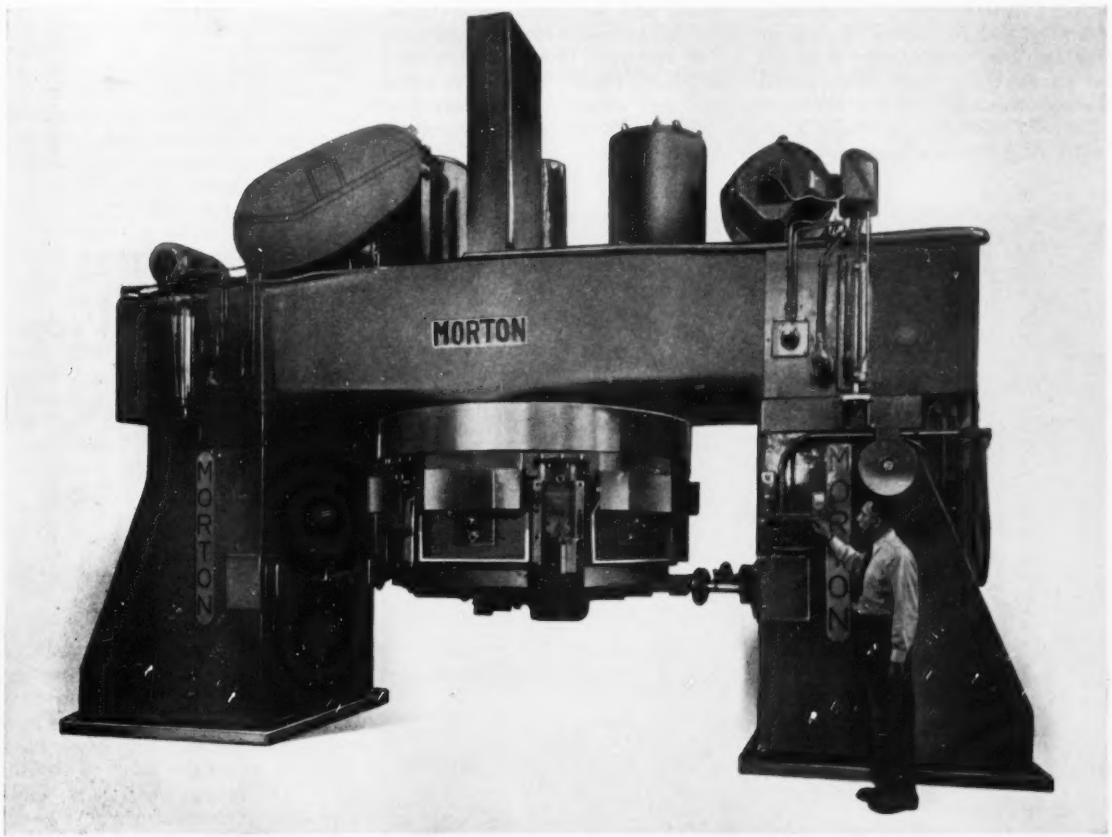
el ACH-2, recirculating air draw furnaces with chamber sizes of 8 by 6 by 14 inches and 12 by 8 by 18 inches, respectively. These furnaces are recommended for use in the tempering of steel and in other operations requiring precise low temperature control. They are said to be particularly useful in uniformly heat-treating aluminum rivets for airplane assemblies and repairs, and for any aluminum fabrication in which closely controlled heat-treatment is necessary before assembly.

These small furnaces follow the design and performance characteristics of large convection types. A stainless-steel retort houses the entire interior, and side-wall baffles are provided to direct the air flow from the fan located below the perforated hearth. The furnace atmosphere is directed outward to baffled side sections and upward behind these baffles, then over the top and into the chamber. It continues downward, being forced through the work and finally returned to the fan. This convection provides uniform absorption of heat by the charge. Baffle walls prevent direct radiation from the elements to the work surface, thus avoiding overheating and uneven temperatures.

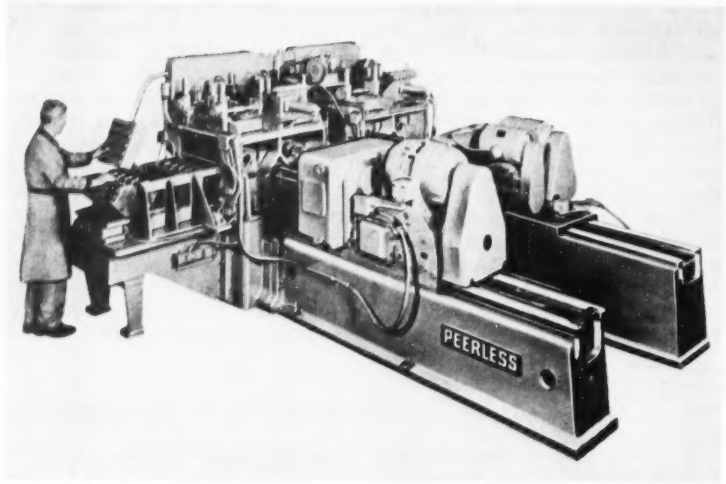
Morton Bridge Type Inverted Boring Machine

A bridge type inverted boring machine built for heavy-duty roughing and finishing operations on large-diameter bores has been developed by the Morton Mfg. Co., Dept. M, Broadway and Hoyt, Muskegon Heights, Mich. This machine was specifically designed for machining the turret ring bore in Army tank hulls and the ring bearing on the bottom of the turrets. The machining operations are performed with the hull in the traveling position and the turret in the inverted position. These positions were selected as being the most convenient for handling the large parts. The machine can also be adapted for use in boring or facing other large work.

The 96-inch diameter boring head and its supporting bridge are lifted hydraulically to provide clearances for moving the work in



Bridge type inverted boring machine for heavy-duty roughing and finishing operations brought out by the Morton Mfg. Co.

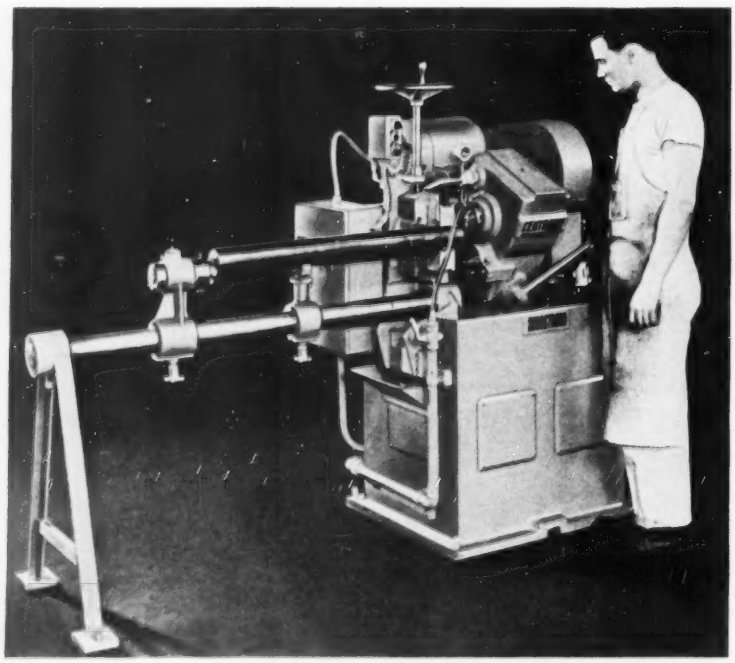


Special transfer machine for processing cylinder blocks

and out of the machine on a traveling fixture. After the part has been placed in the boring position, the bridge is lowered and locked to the columns.

The boring head is equipped with six tool-slides. Each tool-slide has an independent adjustable hydraulic feed. The tool-slides can be arranged for either boring or facing. They may also be mounted at an angle for taper boring. All tool-slides on the boring head are mutually supporting, making an extremely rigid arrangement.

Special tool-blocks are attached to the slides to carry standard carbide-tipped tool-holders. The tool-blocks are designed to provide for the specific cutting operations required. The tool-holders can be adjusted beforehand in the toolroom when the tools are ground. Stops are provided that control the final size of the finished part. The machine is equipped with a 100-H.P. motor to insure ample driving power for heavy-duty roughing operations on extremely tough heat-treated materials.



Sundstrand "Centrmil" for milling and centering operations

Peerless Transfer Machine for Processing V-8 Cylinder Blocks

A special two-station hydraulic-feed horizontal transfer machine for core-drilling and semi-finish-boring camshaft bearings, and for drilling various holes in both ends of cylinder blocks at a production rate of seventy-five blocks an hour, has been designed and built by the Peerless Production Co., Dept. M, 19947 Glendale Ave., Detroit 23, Mich. Peerless transfer sections assembled to form units and hydraulic feeds are incorporated in this machine. Typical features include fixed-center ball-bearing heads with an oil-circulating pump for lubrication, hardened and ground way type units with automatic lubrication, and electrical and hydraulic installations made to J.I.C. standards.

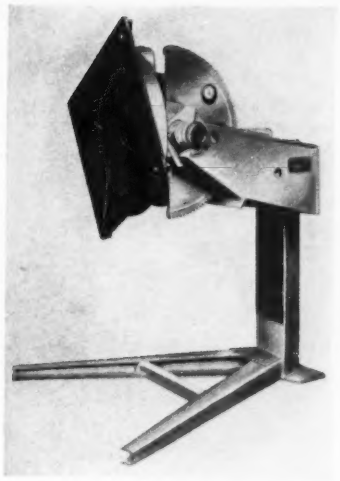
Sundstrand "Centrmil" Milling and Centering Machine

The Sundstrand Machine Tool Co., Dept. M, Rockford, Ill., has announced a No. 0 "Centrmil" milling and centering machine designed to handle work from 3/4 inch to 3 1/2 inches in diameter by 5 to 48 inches long. Simplicity and speed of adjustment are the features that make this machine especially well adapted for use in the lathe department on shaft work.

After a shaft has been located and clamped, the rocket type milling head mills one end. The milled end is then manually centered with a 3/4-inch center drill. Next, the part is reversed and located from the center or end previously machined to permit milling and centering the opposite end. Power feed to the center drill and power clamping can be provided, if desired.

Worthington Welding Positioners

The Worthington Corporation, Dept. M, Harrison, N. J., has announced three new heavy-duty precision positioners for manual or automatic welding. These positioners are being built in capacities of 2500, 3000, and 6000 pounds. A special variable-speed drive for rotating the table provides for stepless speed changing from 0 to the predetermined maxi-



Worthington welding positioner

mum speed by means of an accurately calibrated handwheel or electric remote control.

The table can be tilted through 135 degrees in forty seconds of time. Its height can be adjusted in steps of 6 inches. A tilt indicator facilitates locating the work in the best welding position. The positioners are regularly mounted on steel posts but can be adapted for mounting on columns or walls.

Cleveland Single-Spindle Automatic with Large Cylindrical Tool Turret

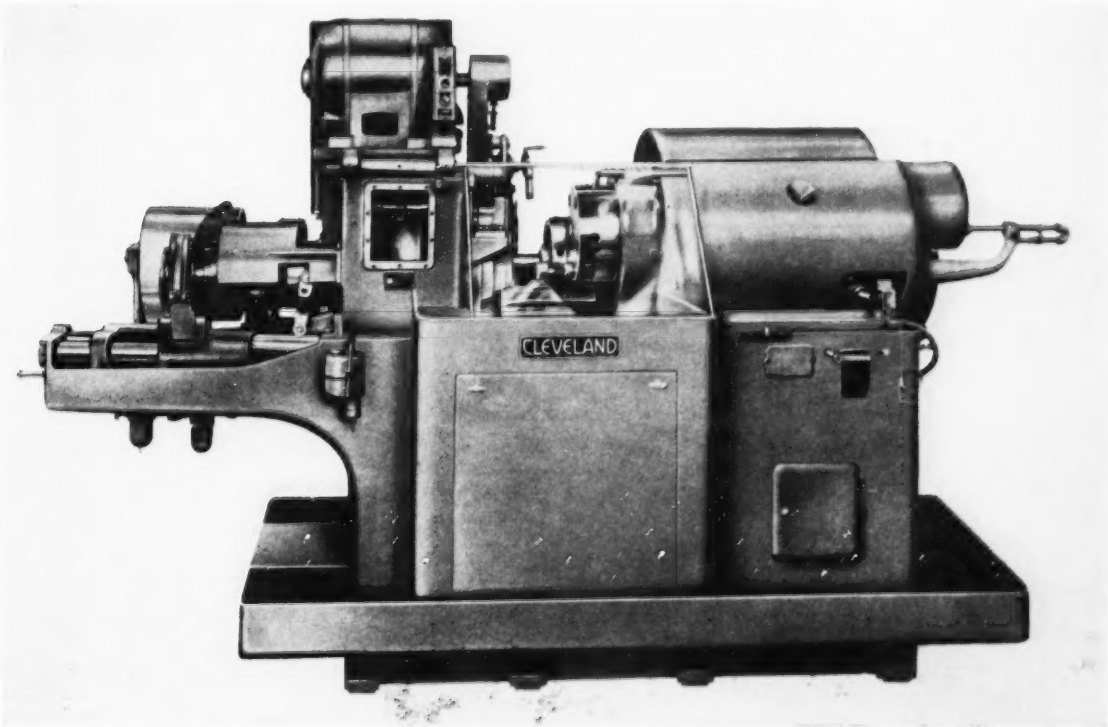
The Cleveland Automatic Machine Co., Dept. M, Cincinnati 12, Ohio, has brought out a 2 1/2-inch Model "AW" single-spindle automatic. Features of this machine include a Geneva turret indexing mechanism, universal camming, quick-change collets, and hand-crank stock feed adjustment. Efficient cutting speeds are provided for all kinds of metals and cutting tools by the forty spindle speeds that range from 69 to 1920 R.P.M. The alloy-steel work-spindle runs in a pair of precision Timken roller bearings having a new semi-flexible mounting that compensates for any expansion that may occur under high-speed operation.

The front and rear cross-slides are wide and rigidly supported on the machine bed to insure smooth, vibration-free operation under heavy forming cuts. Separate adjustable cam drums control each slide and make it possible to accurately adjust the cross-slide tools relative to the turret tools.

The large cylindrical tool turret is fitted into a scraped bearing and has five holes bored in a 9-inch tool circle in line with the work-spindle. Each hole is provided with clamping bushings to hold tools securely. Rapid, shock-free indexing is accomplished by the use of the Geneva mechanism. Variable turret feeds are obtained through a simplified mechanical drive.

Standard cams control the forward and return motion of the turret, as well as that of the two cross-slides and an independent cut-off attachment. Since no special cams are required in going from one job to another, change-overs can be made quickly and easily.

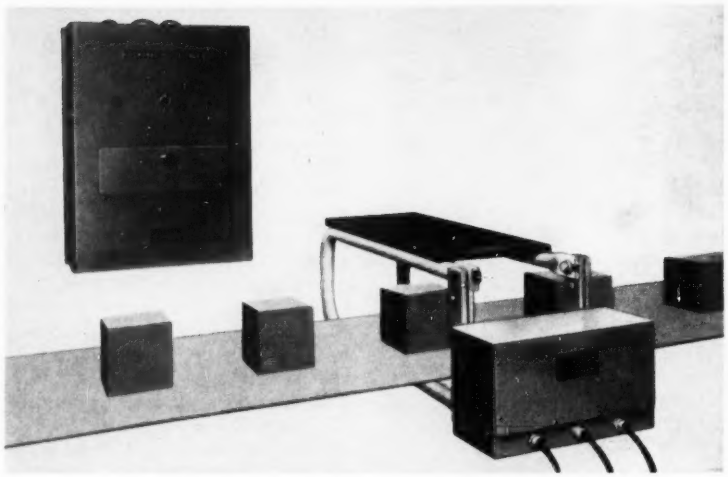
The length of the bar stock feed is set by a hand-crank adjustment and is indicated on a scale bar. The feed-tube is mounted in a cartridge and is attached through a latch, thus providing a quick method for changing feed-shells. The master collet and collet pads are of the Cleveland quick-change type, which permits changing pads without removing master collet from the spindle. A motorized chip conveyor is available to remove chips through an opening under the spindle head at the stock feed end of the machine.



Single-spindle automatic now being built by the Cleveland Automatic Machine Co.

G-E General-Purpose Metal Detector

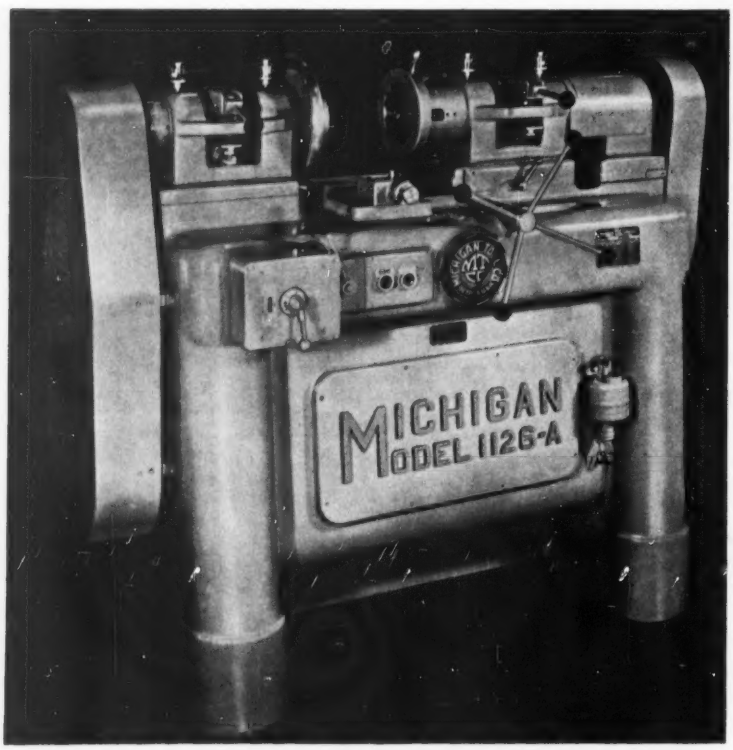
A general-purpose metal detector that can be installed around conveyor systems without cutting the belt and that can be adapted to a variety of applications has been announced by the Special Products Section of the General Electric Co., Dept. M, Schenectady 5, N. Y. This device can be used in manufacturing processes involving the inspection of non-magnetic and non-conductive materials where belt speeds range from 90 to 500 feet per minute. In the mining field, special design features allow the equipment to be installed under adverse conditions to detect metals in non-magnetic and non-conductive types of ore. The detector will discover metal particles in food products and is also adaptable for application in the paper and lumber industries for detecting foreign metal pieces in the product or material being processed. A 105/125-volt 60-cycle 150-watt current is required to operate the detector.



Metal detector for use with conveyor belt systems announced by the General Electric Co.

Michigan Speeders for Testing Transmission Gears

Two gear speeders designed principally for the production testing of automatic transmission gears have been added to the line made by the Michigan Tool Co., Dept. M, 7171 E. McNichols Road, Detroit 12, Mich. Each spindle of the Model 1126-A speeder illustrated is equipped with individual dual drive and brake for testing a set of gears. The Model 1126 speeder, not shown, has one driven spindle. While this spindle is being driven, brake loads are applied to the second spindle. A reversible single-speed motor allows the spindle to be driven in either direction.



Double-spindle, reversible-torque gear speeder with spindle brake

Sets of gears are tested on the Model 1126-A speeders by mounting the sun gear on one spindle and the planetary gears on the other spindle. With this set-up, testing is done by alternately driving each spindle while applying a brake load to its mate. The gears are rotated in the same direction no matter which spindle is being driven. A sun gear can be tested on the left-hand spindle at the same time that a planetary gear assembly is being tested on the right-hand spindle. Double-action clutches are provided for changing the drives to the spindles, which operate on coaxial shafts. These clutches always allow the opposite shaft to act as a driver. Reversal of the motor simultaneously with the clutch reversal allows the gear sets to revolve in the same direction, whether they are driven or braked .

The speeder illustrated is V-belt driven by a 5-H.P., four-speed, electrically controlled motor that provides speeds of 1800, 1200, 900, and 600 R.P.M. for each spindle. The Model 1126 speeder is driven by a single-speed reversible motor. The friction brakes are manually operated and will accommodate a variable load.

Pressure-Testing Machines for Detecting Leaks

Vertical pressure-testing machines designed to detect and locate leaks in castings as well as brazed, welded, and soldered assemblies have been placed on the market by the Hautau Engineering Co., Dept. M, 721 Wanda, Ferndale 20, Mich. These air-operated, electrically controlled machines subject parts to a ten-second automatic check in which the part or a specified area in the part is charged with a given volume of air. Loss of air pressure, indicating a leak or flaw in the part is indicated by signal lights through a sensitive measuring system.

The machine illustrated detects and locates leaks in a rifle grenade assembly fabricated by soldering together several spun copper parts. Four test stations are provided in the machine to enable the testing of four grenades at a time. Two stations are unloaded and loaded while two stations are making the air check.

In operation, the two left-hand stations are loaded by placing the grenades in rubber-faced spring clamp jaws. The test cycle for these stations is initiated by pressing two interlocked cycle start-buttons on the control panel. This causes air cylinders above the station to lower a clamping head, thus sealing both ends of the parts for the test. O-ring seals and rubber-faced seals in the clamping adapters seal both ends of the grenade, as well as each end of a square tube in the assembly. With the grenade securely clamped, build-up of pressure in the cylinder causes the test cycle to start automatically. Then a chamber in the grenade is charged with a given volume of air. Any leakage of air is indicated by the signal lights, thus showing a defective part or a joint that is improperly soldered. The machine operates on an air-line pressure of 80 pounds per square inch and an electric line of 110 volts. The complete cycle time needed to load, check and unload two parts is seventeen seconds.

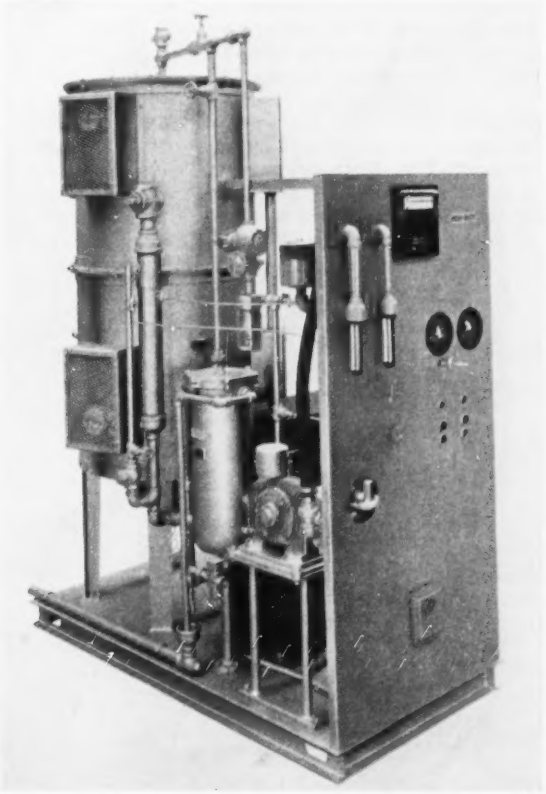
Endothermic Gas Generator for Producing Controlled Atmosphere

The Hevi Duty Electric Co., Dept. M, Milwaukee 1, Wis., has brought out an endothermic gas generator designed to produce a controlled atmosphere of consistent chemical analysis for heat-treating operations. This generator will produce atmospheres for such operations as bright hardening of high-carbon steels without oxidation or decarburization; bright hardening of molybdenum, tungsten, and cobalt high-speed steel; annealing and normalizing; bright copper brazing, carburizing, and carbonitriding; and sintering processes that require a reducing atmosphere.

The generator is a complete package unit. The air filter, air gas mixing machine, gas cracking chamber, gas cooler, control panel, and power transformer are all mounted on a structural steel base.



Hautau pressure-testing machine equipped to detect and locate leaks in rifle grenades



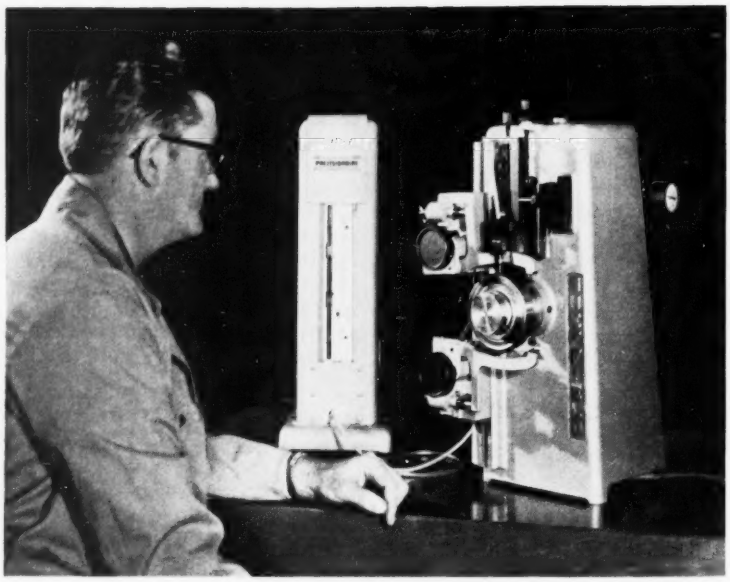
Hevi-Duty generator for producing controlled atmosphere for heat-treating operations

Sheffield Gaging Equipment for Measuring Play in Ball and Roller Bearings

A "Plunjet" gaging cartridge and a column type air gage for measuring radial play in ball and roller bearings have been placed on the market for the Sheffield Corporation, Dept. M, Dayton 1, Ohio. This application of air gaging has been developed to permit highly accurate measurement of the radial play at higher amplifications than is possible with dial indicators. Two standard models are available, one for bearings with an outer diameter ranging from 18 to 90 millimeters, and the other for outer diameters from 90 to 180 millimeters. The measuring loads of both models are adjustable to the standards of the Anti-Friction Bearing Manufacturers Association, Inc., Revision No. 1, April, 1952.

The instrument has two adjustable, air-operated, pivotal load-bearing arms that alternately exert upward and downward pressure on the bearing. The resulting successive movements of the outer ring are measured by the movements of the float in the glass column. The amount of radial play of the bearing in the position tested is represented by the difference between the measurements indicated by the two positions of the float.

Among the features are an automatic arrangement for shaking the balls down into the bottom of the groove; means for making direct readings without the use of costly masters; a single three-station foot pedal control of load-bearing arms; easily changed arbors that correspond to the internal diameter of the inner ring of a bearing; and a Sheffield "Guidegage" on each arbor to facilitate inserting the bearing.



Equipment for gaging radial play in ball and roller bearings announced by the Sheffield Corporation

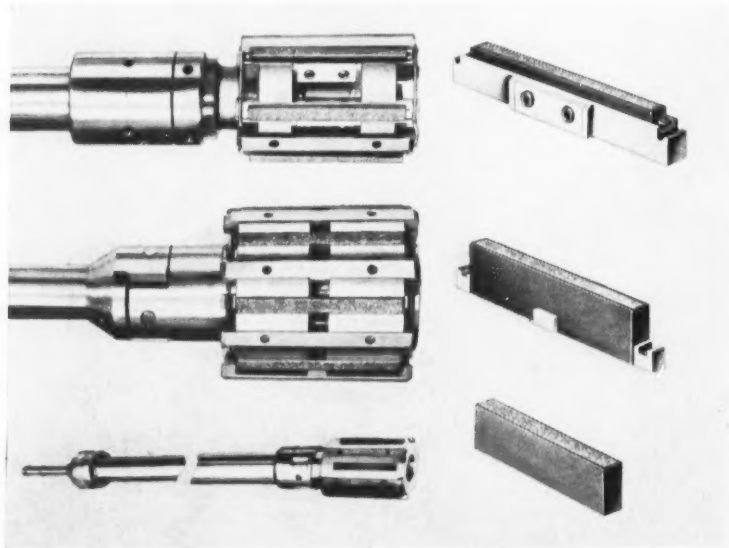
Barnesdril Honing Tools

The Barnes Drill Co., Dept. M, 814-830 Chestnut St., Rockford, Ill., has announced a line of honing tools and honing stones developed to give longer stone life, faster stock removal, and closer accuracy. The new Barnesdril abrasive honing stones may be selected with any grit and grade required in a choice of four mountings. A conventional stone with shell mounting is available for tools now being used.

The Style A abrasive stone with direct holder mounting shown in the upper view to the right in the illustration is available for general-purpose honing applications. The stone is designed for quick clamping in metal holders for maximum ease and economy of replacement.

The high-production Style B stone shown in the center right view is designed with extra depth of abrasive, which provides much longer stone life. This stone is protected on the sides and arranged for improved positive body support at the cutting face. Metal holders support the stone and are arranged with a simplified clamp lock for speed and convenience of insertion and replacement. The assembly of stone and holder is held in place in the tool body by spring tension. This style is most adaptable for general applications.

The Style C stone shown in the



Improved line of high-production Barnesdril honing tools and stones

lower right view is also designed with extra depth of abrasive. The stone is protected on the sides and ends, and arranged for improved positive body support at the cutting face. No holders are used—the stone is inserted and held in the tool body by controlled friction. "Down" time is minimized by the increased stone life and the ease of replacement. This style is most adaptable to specific applications and small diameters.

The three types of honing tools developed for use with the stones described are shown to the left of their respective stones. These Barnesdril honing tools are individually designed to properly accommodate the specific style of abrasive honing stones used. The general-purpose Type A tool shown in the upper left corner of the illustration is available for conventional stone and shell assemblies or Barnesdril Style A honing stones for applications involving a range of bore diameters.

High-production Type B tools, such as shown in the center left view, accommodate the Style B abrasive stones. Improved body support for the stone at the cutting face assures a better drive, freer cutting action, and minimized heat generation. Provisions are incorporated in this tool to actuate the abrasive to obtain 200 to 500 per cent longer stone life. The stone and holder assembly is held in position by spring tension. Stones are quickly inserted or replaced in the metal holder.

Type C tools, seen in the lower left view, accommodate Barnesdril Style C abrasive honing stones. Holders are not required in this tool since the stones are held in position by controlled friction, and are easily inserted or removed.

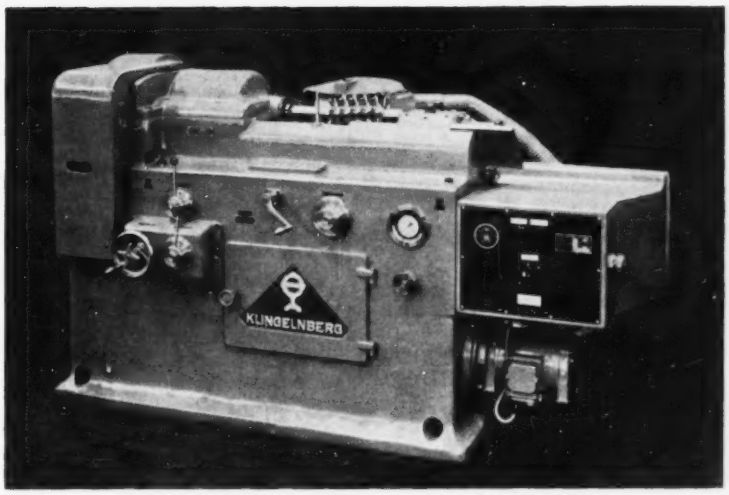


Fig. 1. Tool and cutter grinder introduced by the Kurt Orban Co., Inc.

Hydraulically Controlled Tool and Cutter Grinder

A new method of sharpening gear-cutting hobs, in which the hob table remains stationary while the grinding wheel reciprocates, is incorporated in the design of the Model GW 30 Klingelnberg tool and cutter grinder being distributed in the United States by the Kurt Orban Co., Inc., Dept. M, 205 E. 42nd St., New York 17, N. Y. Hydraulically controlled and automatic in operation, the machine eliminates errors in positioning or indexing when grinding the front rake, holding the indexing accuracy within limits of plus or minus 0.0001 inch.

The set-up for the correct spiral lead is obtained by means of change-gears, which prevent excessive grinding in addition to assuring uniformity. The grinding wheel is swiveled to the correct angle, as indicated on a graduated scale. For any lead, the effective cone generating line of the wheel passes through the hob axis. No special dressing is needed to obtain this result.

In the sharpening operation, both the reciprocation of the wheel and the rotation of the hob are controlled by a single, hydraulically operated threaded spindle, which assures grinding the cutter to the correct lead angle. Indexing of the hob from flute to flute is accomplished by hydraulic pressure. During each reciprocating cycle of the wheel, the pressure forces the index-plate against a pair of pawls, which are placed opposite each other to avoid backlash. At the end of one cycle, the pawls are automatically retracted momentarily and the next fluted indexed into position.

The indexing plate is rigidly mounted on the same spindle as the hob, all intermediate moving parts being eliminated. The index-plate is hardened, and the flanks are specially shaped and hardened. Single-contact surfaces on the flanks, parallel to the axis of the index-plate, mate accurately with the shape of the pawls.

The machine can also be used for sharpening milling cutters and other types of cutters in which high accuracy of tooth spacing is important. It has a maximum wheel-slide stroke of about 20 inches, will grind lengths up to 16 inches, with a maximum depth of 3 3/8 inches and will handle work 12 inches in diameter. On spiral flutes, the lead range is from 15 to 750 inches.

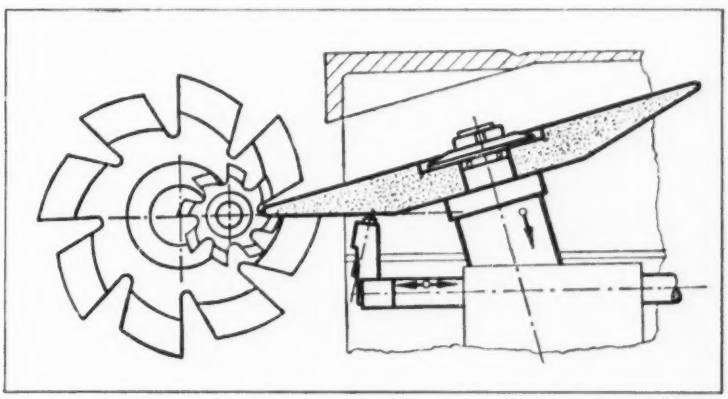


Fig. 2. Diagram showing how cone generating line of grinding wheel passes through hob axis in grinding any spiral lead on machine shown in Fig. 1

Elmes Automatic Press Designed to Reduce Both Ends of Tube in One Operation

A double-end tube-reducing hydraulic press designed to reduce both ends of a seamless steel tube simultaneously has been announced by the American Steel Foundries, Elmes Engineering Division, Dept. M, 1150-J Tennessee Ave., Cincinnati 29, Ohio. In order to prevent any buckling of the work, two reductions are required to bring the 2-inch diameter thin-walled ends of the tubing to the required 1 1/4-inch diameter. Thus, the two-station machine was designed to use a preliminary reduction die as well as a final reduction die. These dies are mounted internally in each ram along with an internal automatic hydraulic knock-out. As the ram returns after the reduction, the knock-out automatically ejects the tube.

To accommodate tubes varying from 3 to 12 feet in length in increments of 6 inches, one cylinder block with its accompanying pumping unit and controls can be moved along the bed by means of a motor-driven lead-screw. Keys across the bed take the thrust load.

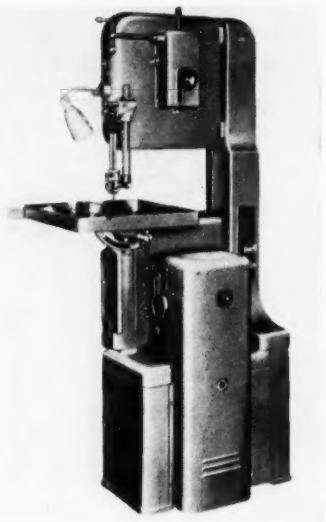
The tubes are fed automatically through the machine, air-operated clamps being used for the longer tubes, thus eliminating any tendency of the tubes to buckle or bend during the reduction. The tube ends are lubricated prior to reduction by two lubricant pump and reservoir units, one for each end of the press.

The press is fully automatic in operation and is capable of performing the reducing operations at a production rate of 150 tubes per hour. It can be designed to accommodate tubing in a wide range of diameters and lengths.

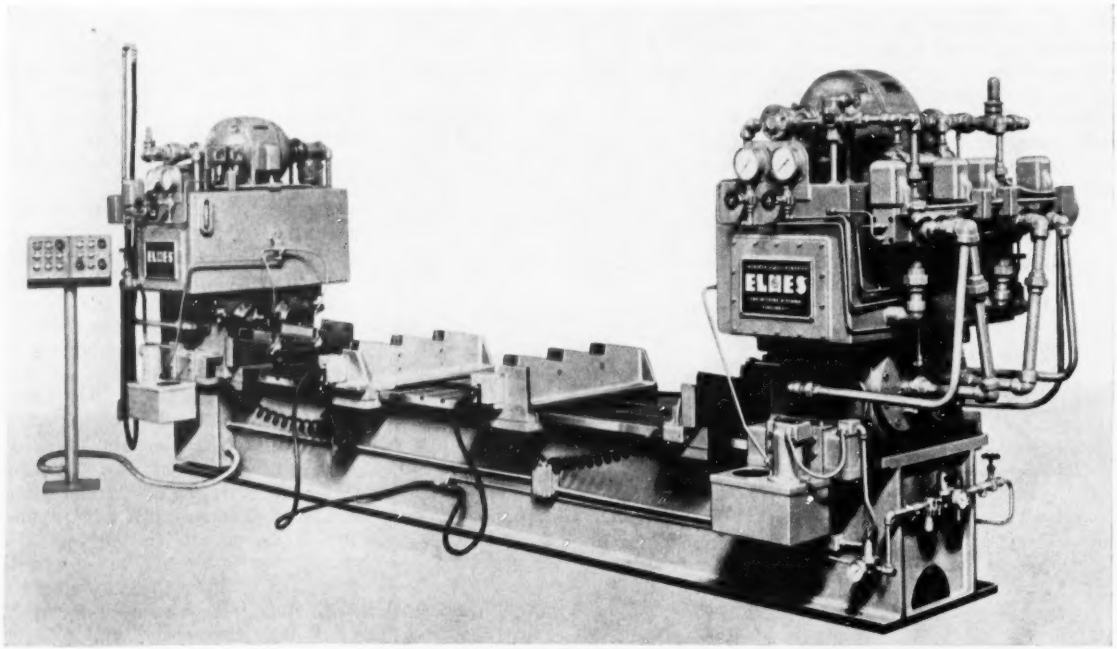
Variable-Speed Band Saw

A variable-speed 16-inch band saw having a speed range of from 50 to 4500 surface feet per minute has been announced by the Walker-Turner Division, Kearney & Trecker Corporation, Dept. M, Plainfield, N. J. Speed changing on this band saw is effected through a handwheel that operates a variable-diameter pulley which is connected to the saw wheel through a gear train. A gear-shift lever having two positions controls the high or low speed range. The low range operates at 50 to 450 surface feet per minute and the high range at 500 to 4500 surface feet per minute.

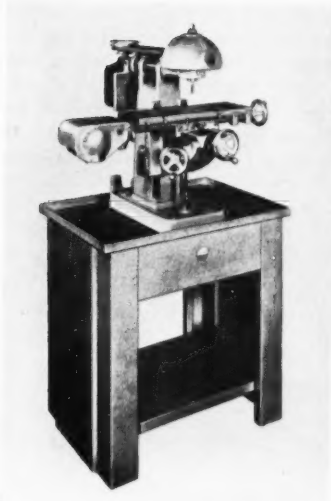
The wide speed range of this machine adapts it for use on all types of ferrous and non-ferrous metals, plastics, wood, and composition materials. The capacity under the guide is 8 inches and from the blade to the frame, 16 inches. The table can be tilted 45 degrees to the right and 5 degrees to the left. The motor is spring-mounted in the base. A 3/4 H.P., 1140-R.P.M. motor is recommended for this machine.



Variable-speed band saw made by the Walker-Turner Division, Kearney & Trecker Corporation



Automatic press designed to reduce both ends of tubes in one operation brought out by American Steel Foundries, Elmes Engineering Division



Benchmaster hand-screw milling machine with power feed

Power Feed Accessory for Milling Machines

A power feed for use on all Benchmaster hand-screw milling machines has been announced by the Benchmaster Mfg. Co., Dept. M, 1835 W. Rosecrans Ave., Gardena, Calif. The accessory is designed to be mounted on the end of the table, two holes being drilled and tapped to attach the feed. A worm-and-gear unit housed in lightweight alloy castings is driven by a small, independent electric motor operating on 115-volt alternating current. This permits table operation which is totally independent of spindle speed.

Four table speeds of 1.2, 2.1, 3.2, and 4.5 inches per minute are available. Table travel is reversible, permitting milling in either direction. Automatic stops are adjustable for any desired length of stroke. A disengage lever is provided to permit manual operation. The power feed accessory is 4 1/2 by 5 1/2 by 8 inches.

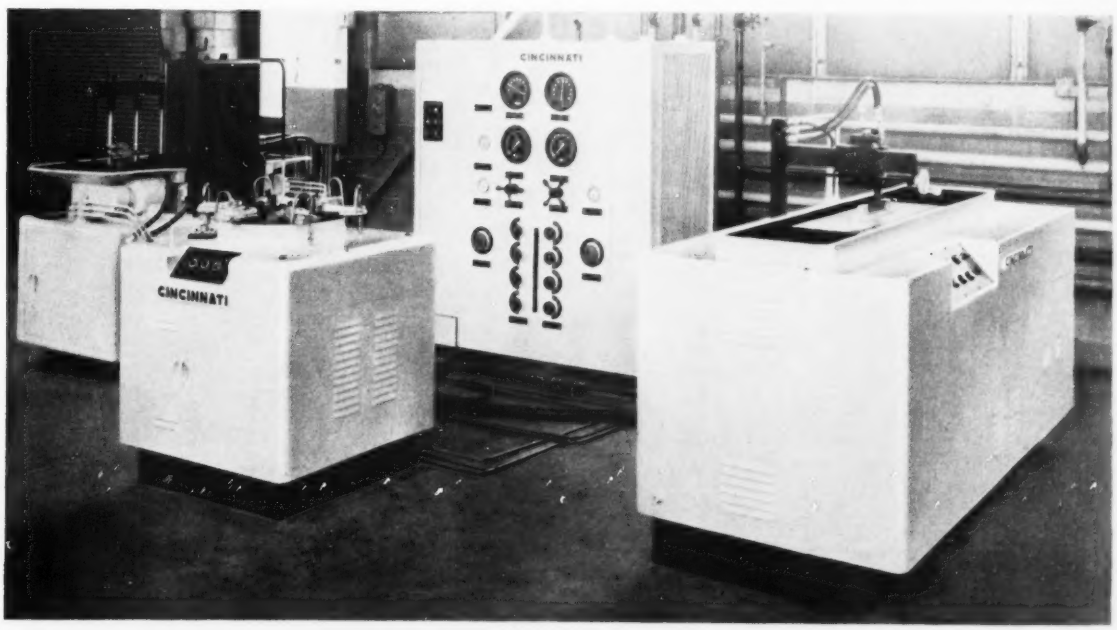
Cincinnati Flamatic Power Control Unit for Hardening and Brazing Equipment

Extremely precise control of the fuel gas and oxygen used for various selective heating operations is provided by the Flamatic power control unit recently placed on the market by the Cincinnati Milling Machine Co., Flamatic Division, Dept. M, Cincinnati 9, Ohio. Three selective heating set-ups, two for hardening and one for brazing, under the control of a No. 2 Flamatic unit (arranged for demonstration) are illustrated. The Flamatic power control unit, shown in the center of the illustration, provides precise control of temperature to insure uniform results; accurate metering of fuel gas and oxygen to achieve exact control of heat input; and automatic cycling except for loading and unloading parts. It permits the use of a wide variety of simple, low-cost tooling and work-handling units. Thus the user can change from one job to another without dismantling the tooling, and then return and re-run a job at any time with the assurance of duplicating the original results.

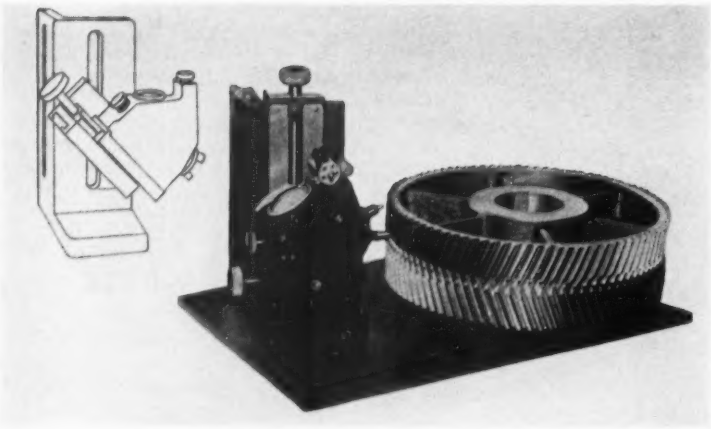
The Flamatic power control unit, in addition to controlling fuel gas and oxygen, also controls the pressure of water used for cooling and quenching; the pressure of the air used for actuating cylinders; and the electrical power for automatic work movement and operational cycling. This unit is furnished in three sizes with two, four, and six mixed gas circuits, respectively. The largest unit, at present, has a maximum capacity of 4500 B.T.U. per hour or the equivalent of 1320 K.W. per hour.

Referring to the illustration, the combination hardening unit shown at the extreme left is set up for simultaneously hardening up to six piston rods, shafts, or similar parts. The parts are rotated while the burner and quench assembly moves vertically.

The automatic indexing and brazing unit shown at the left center has a turntable that in-



Flamatic power control unit shown at center connected to three selective heating units, two for hardening and one for brazing



"Penetrascope" set-up for testing hardness of large herringbone gears

dexes parts in sequence over several work stations equipped with burners that perform their brazing cycles automatically. The work in this case consists of brazing a breather tube to a cover.

The progressive hardening unit shown to the right is equipped for heat-treating pinion rack teeth and similar work. The burner and quench assembly is stationary and the work moves horizontally.

Cross "Transfer-matic" for Machining Intake Manifolds

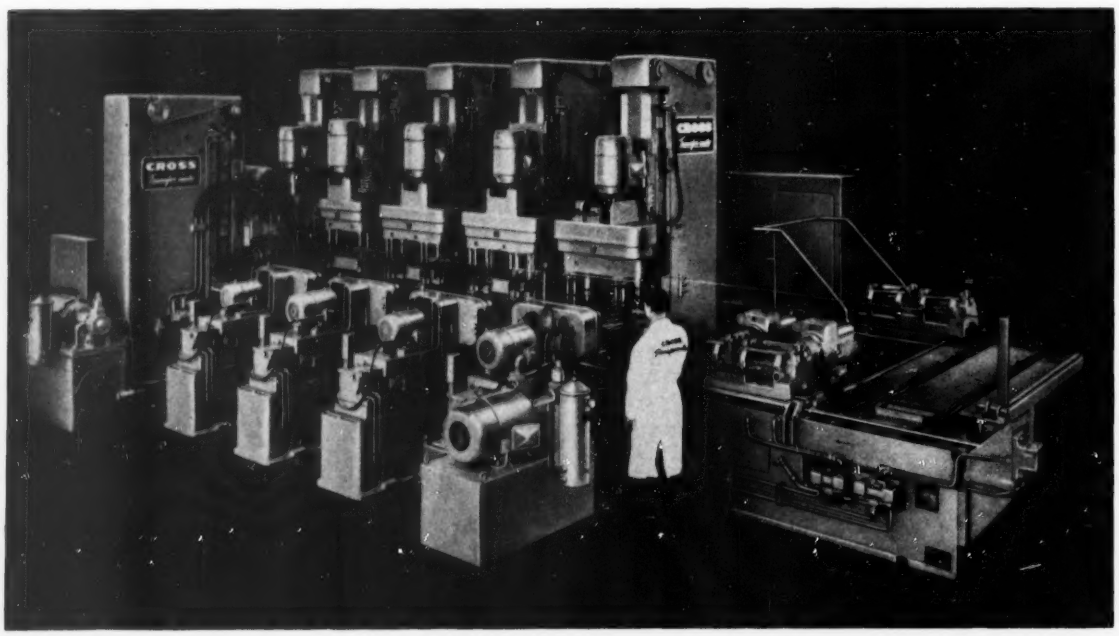
A special "Transfer-matic" machine for drilling, boring, and milling intake manifolds has been announced by The Cross Company, Dept. M, Detroit 7, Mich. This machine has seven stations, two of which are used for loading and unloading. It performs a total of fifty-four operations: twenty-two drilling, eight chamfering, two reaming, twelve tapping, eight boring, and two milling. Two parts are machined simultaneously at each station. The production rate of the "Transfer-matic" is 218 manifolds per hour.

Pallet type work-holding fixtures are used to carry the irregular-shaped manifolds from station to station, and power wrenches are employed to operate the fixtures automatically. Many other advanced features, such as pre-set tools, a built-in chip conveyor, and an automatic cleaning unit for removing chips from the fixtures, are incorporated in this machine. Electrical and hydraulic construction is according to Joint Industry Conference standards.

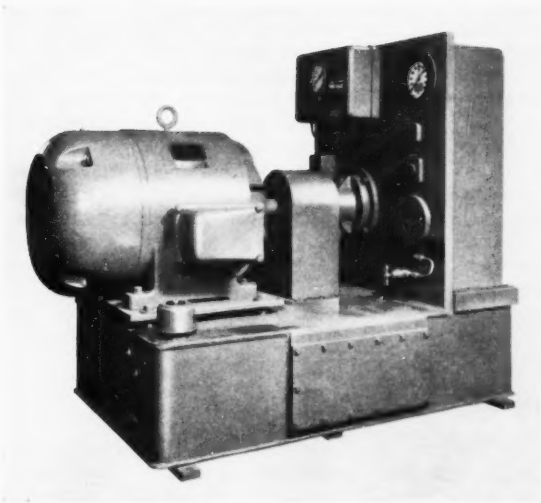
"Penetrascope" Hardness Tester

A multiple-angle semi-portable metal hardness tester has been placed on the market by C. Tennant, Sons & Co., Dept. M, 100 Park Ave., New York 17, N. Y., which was developed for testing parts that are inaccessible when clamps are employed and which can be adapted for use as a bench type hardness tester. This new "Penetrascope" is adjustably mounted on a slotted stand, the base of which contains electromagnets that hold the unit firmly to a surface table, lay-out table, or other ferrous base.

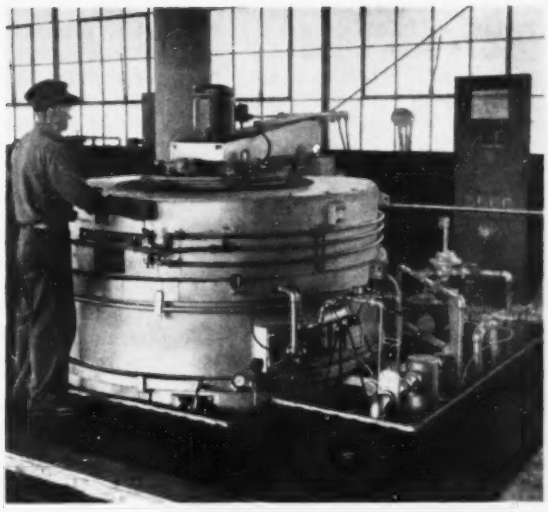
The object to be tested is held securely, either by its own weight or mechanically, so that it will not move in relation to the common ferrous base on which the stand is also set. The unit is capable of both conventional and multiple-angle testing.



Special "Transfer-matic" for machining manifolds built by The Cross Company



Hydraulic power plant built by John S. Barnes Corporation



Westinghouse gas-fired, pit type furnace

Hydraulic Power Plant

A hydraulic power plant was recently completed by the John S. Barnes Corporation, Dept. M, 325 S. Water St., Rockford, Ill., for the Electric Boat Division of the General Dynamics Corporation. This equipment complies with the requirements established for the "S I R" project, a nuclear submarine being built by the Electric Boat Division.

Outstanding features of this hydraulic power plant are the extreme compactness necessitated by the limited floor space available, and the ready accessibility of all hydraulic components for servicing. It was built to the rigid standards set up by the Joint Industrial Committee on Hydraulics.

Westinghouse Pit Furnace

A gas-fired, pit furnace for cycle annealing of small hand tools is available from the Westinghouse Electric Corporation, Dept. M, Box 2099, Pittsburgh 30, Pa. This furnace can also be used for carburizing, hardening, and nitriding. A removable retort makes continuous operation possible, since one retort can be discharged and recharged while the other is in the furnace. The maximum operating temperature is 1600 degrees F.

The hydraulically operated furnace cover is suspended from a pivoted arm so that it can be

Ipsen Automatic Unit for Regulating Dew Point in Controlled-Atmosphere Heat-Treating Furnaces

An automatic dew point controller that regulates the dew point in controlled-atmosphere metal-treating furnaces has been developed by Ipsen Industries, Inc., Dept. M, 715 S. Main Street, Rockford, Ill. This self-contained unit operates electronically, and continuously records and controls the furnace dew point.

The dew point controller is adjustable to meet any required dew point within the capacity of the particular furnace to which it is attached. It pumps furnace atmosphere through a 5/16-inch steel tube. By the use of a cooling element, the controller condenses water on a measuring device. This condensation temperature is measured electrically, then indicated, recorded, and controlled. The accurate control of the dew point thus obtained assures bright, scale-free work in a wide variety of heat-treating operations including carburizing, carbo-nitriding, carbon restoration, annealing, normalizing, and hardening.



Operator setting scale on Ipsen automatic dew point controller

pushed to either side when raised. Firing of this furnace is completely automatic, and a combustion blower system is used for purging and cooling purposes. In addition, instruments are provided for turning off the gas in case of flame failure and for shutting off the gas in case of low pressure.

The furnace is available in five sizes ranging from a charge space 14 inches in diameter by 18 inches deep with an approximate production rate of 120 pounds per hour to 30 inches in diameter by 72 inches deep with an approximate production rate of 2100 pounds per hour.

Famco Power Presses

The Famco Machine Co., Dept. M, 3134 Sheridan Road, Kenosha, Wis., has added a 13-ton "Electromatic" power press and a second 13-ton "Multipower" press to its line of bench and floor type power presses in the capacity range of 3 to 18 tons. The new 13-ton Model 56-E press has the same type of instant action, electrically operated nine-point jaw clutch as that incorporated in the 18-ton "Electromatic" press announced in June, 1952, MACHINERY, page 212. This "Electromatic" clutch is designed to combine the simplicity of electric control and the high efficiency of jaw clutches. The 56-E press is adjustable for either single stroke non-repeat or continuous action, without stopping the press. The second 13-ton Model 56-J press is equipped with a Famco "Multipower" nine-point mechanical type jaw clutch, thus making available two clutch type presses in the 13-ton capacity class.

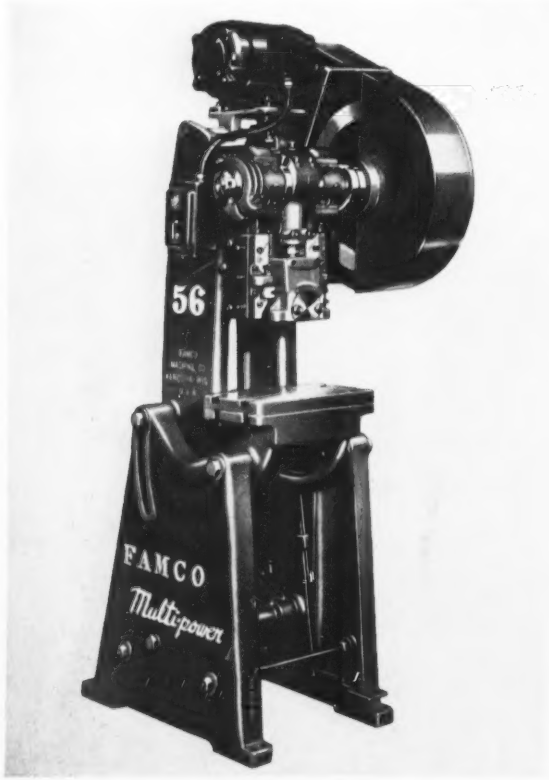
Models 56-E and 56-J are constructed of close-grained extra heavy cast semi-steel. They have one-piece, heat-treated alloy crankshafts, main bearings with split bronze bushings, and greater ram area. Balanced flywheels are provided with Timken tapered roll bearings. Bijur hand or automatic oiling systems are available and may be ordered installed at the factory or added later by the customer. Standard equipment on both models includes a belt and flywheel guard.

Danly Adjustable Press Control Unit

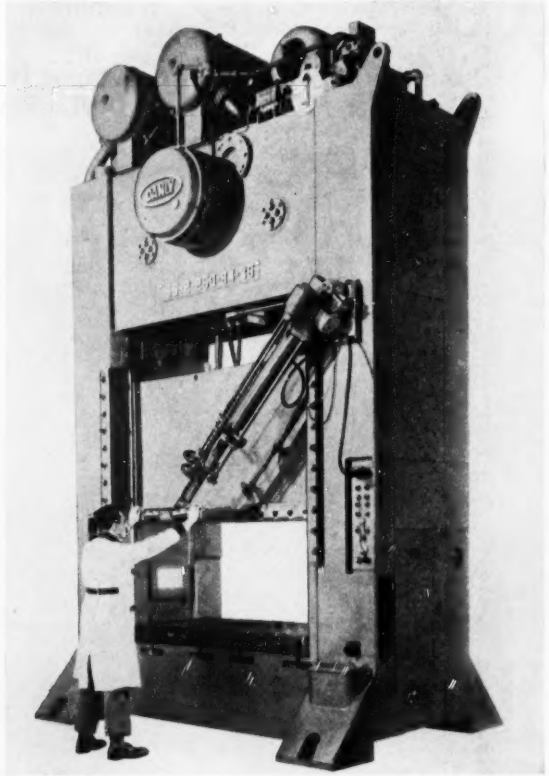
A press control unit designed to provide a flexible method for positioning the "run" and "stop" push-buttons has been brought out by Danly Machine Specialties, Inc., Dept. M, 2100 S. Laramie Ave., Chicago 50, Ill. The push-button control bar of this unit is suspended by a universally adjustable telescoping arm, as shown in the illustration.

With each change of dies or operating procedure, the adjustable control bar can be relocated to conserve motion and time, thus increasing the operator's efficiency, comfort, and safety. When changing dies, the arm can be swung completely clear of the working area without blocking aisle space.

The unit becomes a part of the press and requires no additional floor space. Both the height and position of the push-buttons can be quickly adjusted. The major movements or adjustments are made by means of worm gearing operated by handwheels near the control buttons. Finger grips above the "run" push-buttons al-

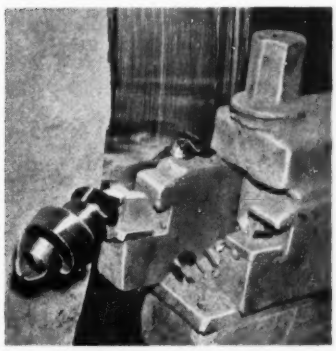


"Multipower" press, a recent addition to the Famco line



Danly press equipped with adjustable control unit

low the press operator to relax his arms during operation. The "run" push-buttons are spaced far enough apart to necessitate the use of both hands to start or control the press, thus assuring maximum safety. The adjustable press control unit is available with Danly presses but can be used on any press.



Tool made of Carboloy cemented carbide Grade 370 taking heavy cut in forging

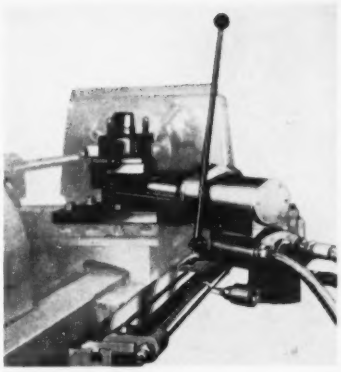
Cemented Carbide for Heavy-Duty Steel Cutting

A heavy-duty, steel-cutting grade of cemented carbide, which is said to speed up machining operations as much as 30 per cent, was announced recently by the Carboloy Department of General Electric Co., Dept. M, Detroit 32, Mich. It is claimed that cutting tools of this material are capable of removing steel faster and providing up to 50 per cent longer tool life than any of the cemented carbides previously available. This Carboloy Grade 370 cemented carbide was developed for taking heavy cuts at higher tool temperatures and is the first grade in an entirely new carbide series.

A new carefully controlled manufacturing process is said to give the Grade 370 carbide the structural rigidity necessary to resist deformation under heavy cuts and high temperatures, even up to 1800 degrees F. Cutters of this material are now being used for turning locomotive wheels and steel mill rolls, and for machining heavy gun breech-blocks, shells, and turbine rotor shafts. This carbide grade cutter material is composed of tungsten carbide, titanium carbide, tantalum carbide, and cobalt. It has a density of 12.60, and Rockwell hardness on the A scale of 91.0. The illustration shows a Grade 370 carbide tool taking a 1 1/4-inch cut on a 75-inch diameter forging used for a cylinder head in a hydraulic steel forming press. Tool life on this particular job was said to have been increased 50 per cent.

Bondycop Hydraulic Copying Attachment for Lathe

The Morey Machinery Co., Inc., Dept. M, 410 Broome St., New York 13, N. Y., is introducing a Bondycop hydraulic copying attachment for lathes. This attachment is made in two sizes, a 3 1/4-inch size for lathes with swings of 10 to 13 inches and a 6-inch size for lathes with swings of 14 to 20 inches. The copying unit is used for duplicating parts and has the advantage of copying any angle up to 90 degrees, as well as straight or irregular contours. It also permits internal and external copying through the use of templates and in no way interferes with the output of the lathe when the attachment is not being employed.

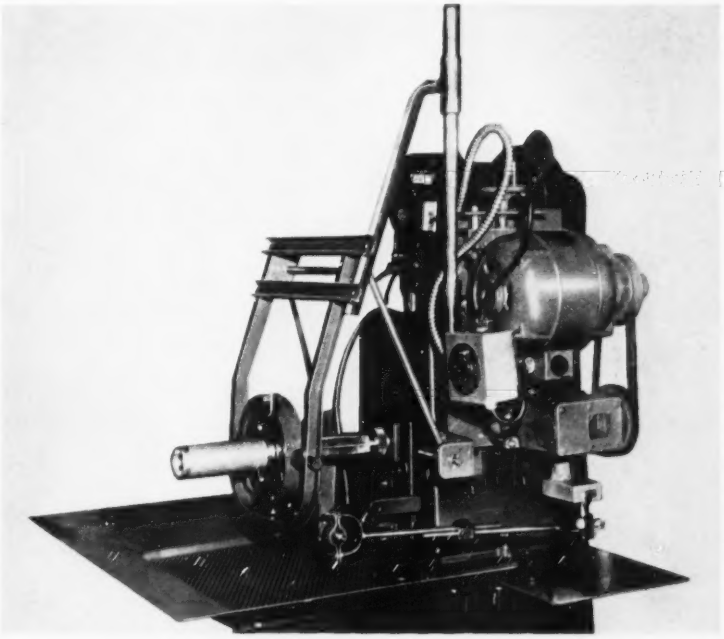


Morey Machinery Co., Inc., introduces Bondycop hydraulic copying attachment for lathe

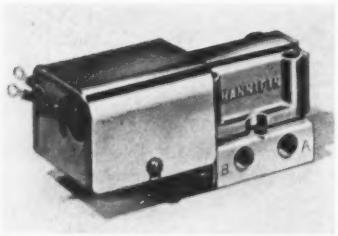
The standard size Bondycop can be used for work diameters up to 6 inches and work lengths from 16 to 100 inches. It has only three essential parts: the motor-driven hydraulic pump, the template-holder and the hydraulic slide with tool-holder.

Stroking and Timing Attachment for Honing Machines

A stroking and timing attachment for converting manually operated honing machines into automatic units has been developed by the National Pioneer Co., Dept. M, 1134 Nebraska Ave., Toledo, Ohio. Manufacturer's tests are said to have shown that an operator can increase the production of a single machine by one-



Automatic stroking and timing attachment for honing machines developed by the National Pioneer Co.



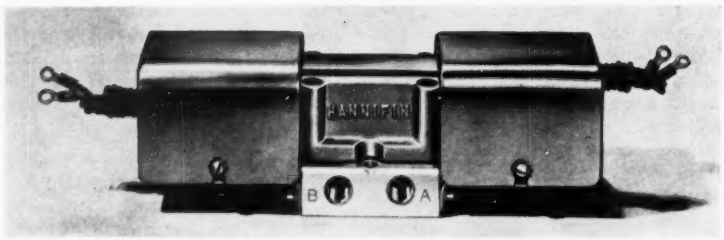


Fig. 1. (Left) Hannifin solenoid-operated four-way valve with single solenoid.
Fig. 2. (Right) Double solenoid-operated Hannifin four-way air valve

third through the use of this attachment, or he can run several machines at the same time.

It is claimed that spherical honing, formerly considered impractical, becomes economically feasible by means of the new attachment. Standard attachments are available for most horizontal honing machines.

Link-Belt Geared Flexible Couplings

A line of geared flexible couplings for high-speed and high-torque applications has just been brought out by the Link-Belt Co., Dept. M, 307 N. Michigan Ave., Chicago 1, Ill. These couplings are designed to combine sturdiness and light weight, transmit power efficiently, and permit a reasonable amount of shaft misalignment and end float. Ten standard sizes are available, with bores from 1 inch to 6 inches in diameter and with ratings at 100 R.P.M. ranging from 2 to 450 H.P.

The coupling hubs can be bored for either a slip or shrink fit on the shafts, and the two-section, free-floating housing has internaly cut gear teeth. Both sections are rabbet fitted and are bolted together to function as a single rigid unit, forming a dustproof, lubricant-retaining enclosure.

Hannifin Solenoid Operated Valves

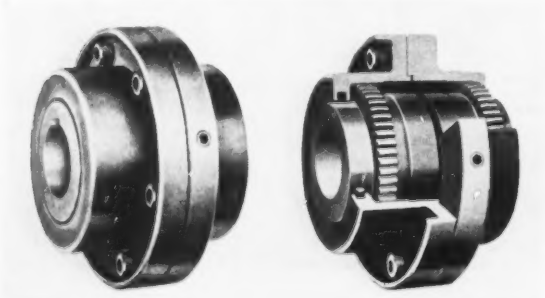
Two new 1/4-inch four-way poppet type valves have been announced by the Hannifin Corporation, Dept. M, 1110 S. Kilbourn Ave., Chicago 24, Ill. These Pilot-Master valves are direct solenoid-operated, compact, simple, and very fast in action. They are recommended for use where speeds as high as 600 cycles per minute are required, and are especially intended for the electric control of small, double-acting air cylinders on short-stroke, high-speed applications, such as switching mechanisms for conveyors, welder cylinders, and clamping and work-positioning cylinders.

The Model CC1-25 valve shown in Fig. 1 is of the single-solenoid type. The single valve stem is the only moving part and is spring-returned. Model CC11-25, seen in Fig. 2, has two solenoids, and its single valve stem remains at either end of its short stroke until the other solenoid is momentarily energized to return it. This makes momentary contact possible, eliminating the necessity of keeping the solenoid energized to hold the valve in its shifted position. The need for a "holding" relay is eliminated with this valve, and it also eliminates the danger that a cylinder might reverse accidentally and either damage the work or injure the operator in the event of an electrical power failure.

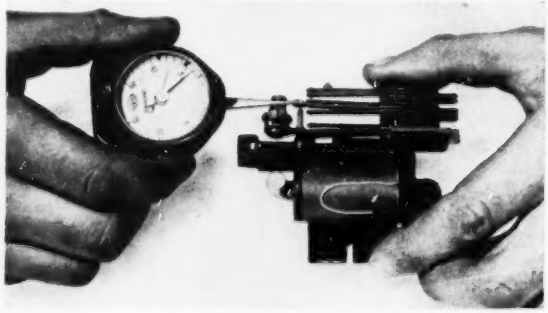
The valve body and the solenoid (or solenoids) can be removed from the pipe connecting manifold for servicing. These full-capacity valves are available tapped either for 1/4- or 3/8-inch pipe or tubing connections.

Precision Dynamometer for Measuring Spring Tension

The George Scherr Co., Inc., Dept. M, 200 Lafayette St., New York 12, N. Y., is introducing in this country a precision dynamometer for measuring spring tension, starting torque, and the force required to actuate delicate mechanisms. This instrument is designed to serve as an aid to the inspector or engineer in determining and checking the pressure required to overcome spring tension and other kinds of resistance in fine precision mechanisms such as electric contacts, relays, telephones, clocks, business machines, micro motors for electric razors, windshield wipers and time switches. To eliminate the necessity of observing and watching the



Geared flexible couplings made by Link-Belt Co.



Precision dynamometer for measuring spring tension

(This section continued on page 239)

LIGHT MILLING PACE-SETTER

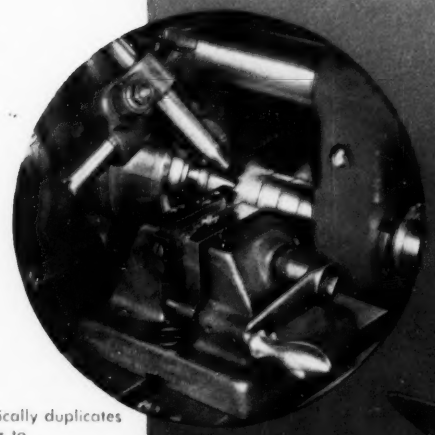


The
No. 000
Plain
Milling
Machine

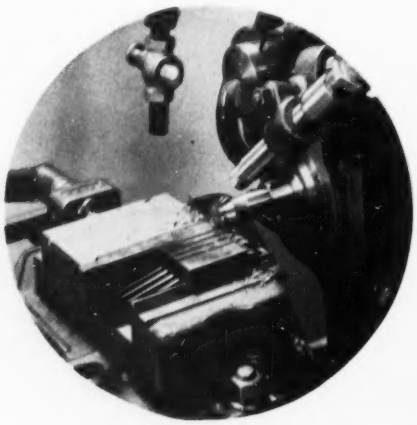
Brown & Sharpe

Makes Light Work of all Light Milling Jobs . . .

The No. 000 Plain Milling Machine is specifically designed for fast, effortless milling of small parts. Its extremely rapid automatic cycles pace the operator for uniformly high production rate with minimum fatigue. Moreover, its uniform cutting feeds extend cutter life, assure greater accuracy of work, and permit positive duplication of surface finish on every part. In nearly every plant there are many jobs to keep the No. 000 busy, continuously . . . milling small parts for business machines, firearms, appliances, timers, and similar products. Its important design advantages are illustrated.

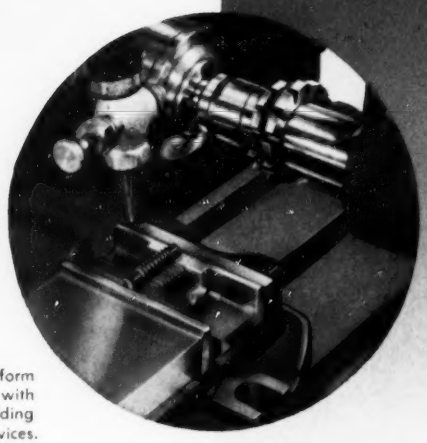


Automatically duplicates blind cuts to accuracy within .002".

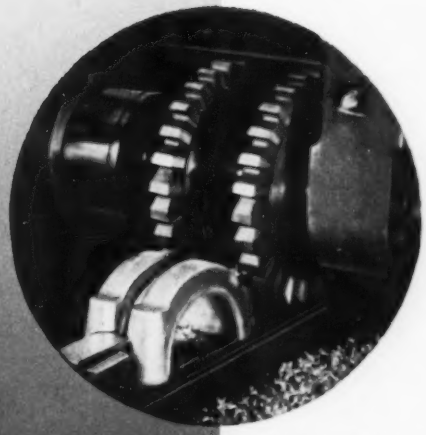


Takes short cuts practically as fast as operator can load fixture.

Brown & Sharpe

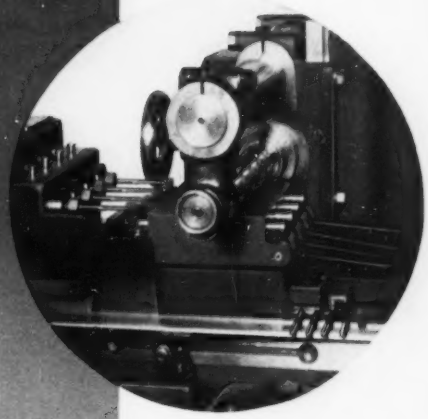


Rapidly handles light form milling jobs with inexpensive holding devices.



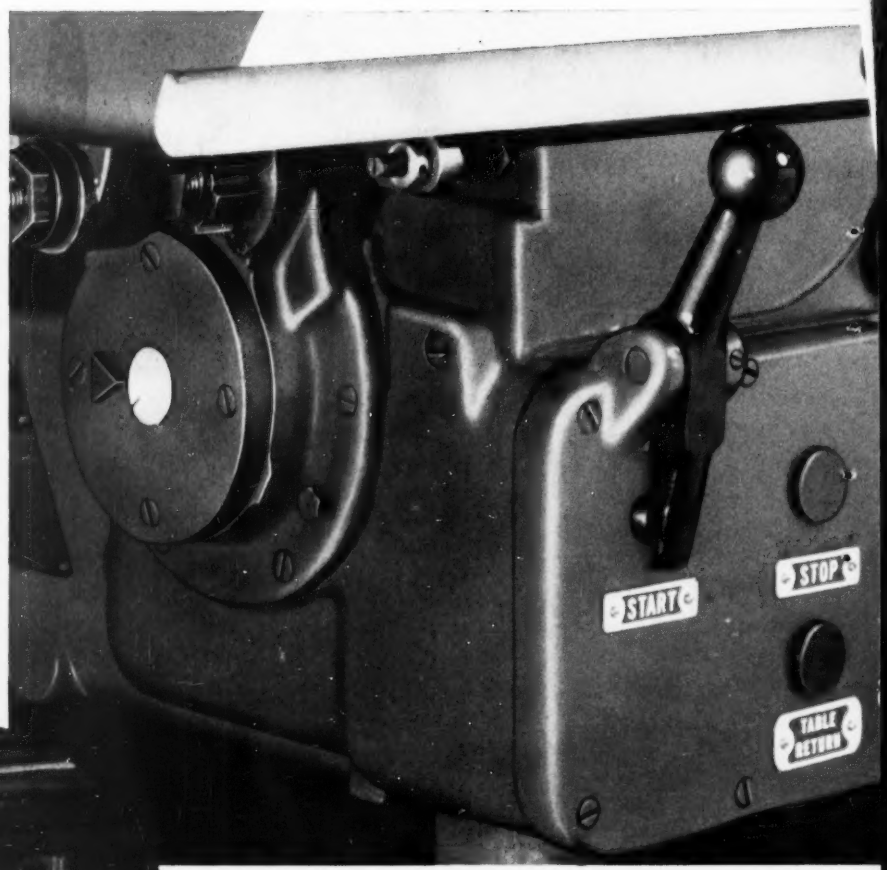
Uses comparatively large cutters or the smallest end mills . . . even permits climb milling.

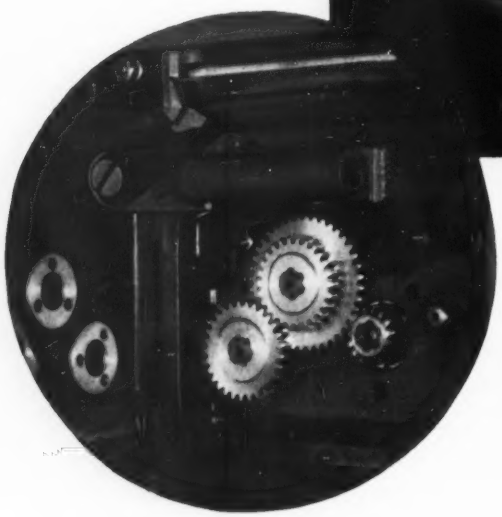
Special fixtures, like this one, speed up output even more.



Complete Milling Cycle Controlled by ONE Lever

You just pull the starting lever on the No. 000 Plain Milling Machine and the table moves forward at 365" per minute; cutting feed automatically engages just before work meets cutter. After cut is completed, table automatically returns at same fast travel. Table reversal is accurate to within .002" . . . advantageous for blind milling operations.





Easy to Set Up for Highest Efficiency

Simple "pick-off" gears provide 16 automatic cutting feeds from 5/16" to 24 3/8" per minute. The single table dog is quickly adjusted to minimize non-cutting time . . . engages cutting feed just before work meets cutter. 16 spindle speeds from 105 to 2340 rpm (161 to 3540 rpm optional) are quickly available for efficient milling on many different materials from tough alloy steel to free-cutting materials like aluminum. Write for detailed Bulletin describing the No. 000 Plain Milling Machine.

Brown & Sharpe B·S

Milling Machines • Grinding Machines • Screw Machines • Cutters • Machine Tool Accessories
Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

Printed in U.S.A.

graduation, a special friction leader hand, moved by the indicator hand, will stop and remain set at the highest point of pressure attained in the test. The hand is set back by the knurled knob.

The instrument is available in a small and a large model, each with several range capacities, and graduated to read in grams of pressure in both directions. The small model is made in five size ratings with torque capacities ranging from 5 to 15 up to 25 to 150 grams. The large model is made in three sizes with torque ratings of 25 to 250, 50 to 100, and 100 to 1000 grams.

Precision Boring Machine Unit Designed for Mounting on Assembly Jigs

A precision boring machine unit designed for close tolerance boring yet compact enough for mounting on work-holding fixtures or assembly jigs is now available from the Hydro-Borer Co., Dept. M, 1601 E. Olympic Blvd., Los Angeles 21, Calif. This S-6 model is 29 1/2 inches long, 6 3/4 inches high, 5 1/4 inches wide, and weighs 70 pounds. The main housing, designed for mounting on the fixture or machine bed, is 9 3/16 inches long by 3 3/4 inches wide.

As in other Hydro-Borer models, the spindle is fed into the work by a positive oil displacement arrangement. Tolerances of plus or minus 0.0003 inch and finishes to 20 micro-inches r.m.s. or better are claimed for this equipment. The unit has a capacity for boring holes from 3/8 inch to 6 1/2 inches in diameter and a travel length of 6 inches. Provision is made for increasing the bore diameter a total of 0.014 inch in increments of 0.001 inch without resetting the tool. The feed of 0.004 inch can be reduced to 0.002 inch. The S-6 unit is available for right- or left-hand mounting.



Fig. 1. Ingersoll-Rand Impactool



Fig. 2. Angle head attachment

Ingersoll-Rand Electric Impactool and Angle Head

The Ingersoll-Rand Co., Dept. M, 11 Broadway, New York 4, N. Y., has just announced a new size electric Impactool designed to save time and effort on nut running, tapping, screw-driving, reaming, drilling, and similar jobs. This 2U Impactool, seen in Fig. 1, is designed for running nuts up to 1/4-inch bolt size. It automatically delivers a series of powerful rotary blows to the work when resistance to turning is met, without subjecting the operator to a kicking or twisting action. The tool is suited for use in electric motor and small gasoline engine repair shops, sheet-metal work, equipment installation and repair, and general maintenance applications where a small, powerful tool is needed for nut running, reaming, and tapping.

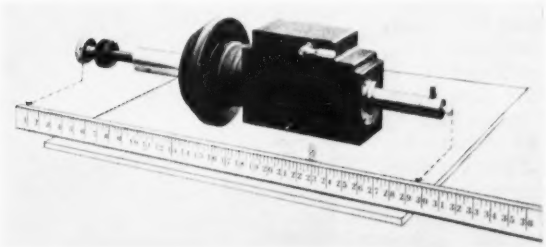
The tool weighs 5 pounds, is 9 3/8 inches long over-all, and measures 1 15/32 inch from one side to center. The motor cannot be burned out by overloading, and will operate from any 110-volt source—60, 50, 40, and 25 cycles, alternating current, or 110-volt direct current.

The new angle head attachment shown in Fig. 2, for use with Impactools, is another new Ingersoll-Rand product. Two sizes of this attachment are available, one for use with Impactools with 1/2-inch square drivers, the other for use with 5/8-inch square drivers.

The angle head attachment is designed to enable the mechanic to reach the really "hard-to-get-at" nuts and bolts with an Impactool. The attachment snaps on the tool just like a socket, and can be rotated 360 degrees in relation to the handle. The height to the shoulder of the square driver measures 3 inches and the over-all length is 6 1/4 inches. Any sockets or chucks used on Impactools will work just as well as on the angle head attachment.

S & E Tungsten-Carbide Reversible Type Plug Gages

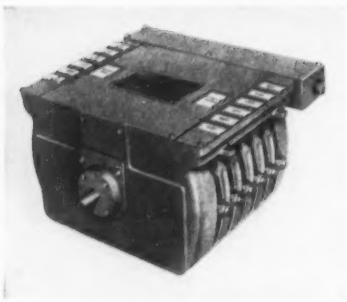
S & E Machine Products, Inc., Dept. M, Bridgeport, Mich., have announced a new line of tungsten-carbide reversible plug gages that extends the size range beyond the customary American Gage Design Standard maximum diameter of 0.510 to 0.760 inch. The gaging members are ground and lapped to exacting finish and size and are available in tolerance classes XX, X, Y, and Z. Collet type handles of polished aluminum are provided in proportionate sizes to accommodate the full range of diameters. Clamping nuts are anodized in green and red colors to denote Go and Not Go members, respectively. Handle markings are engraved and filled to provide for easy size identification.



Precision boring machine unit made by Hydro-Borer Co.



S & E tungsten-carbide reversible type plug gages



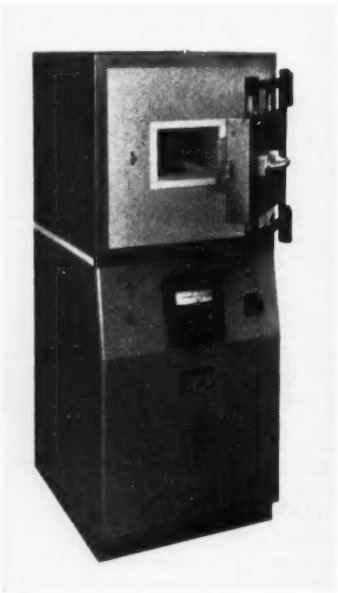
Danly Rotary Type Cam Limit Switch

Rotary cam limit switch that can be adjusted during operation and permits split second timing has been developed by Danly Machine Specialties, Inc., Dept. M, 2100 S. Laramie Ave., Chicago 50, Ill., to meet the automatic control requirements of mechanical presses. The provision for external adjustment during operation simplifies the synchronizing of independently powered auxiliaries with the press cycle since the press can be stroked while individual switches are being adjusted. Fine adjustment of each switch is made by a thumbscrew. Double-break snap switches are used for safety and to permit more accurate timing at the moment of contact. Circuits can be wired so that the "make" and "break" can be timed independently. The circuit to be controlled can be closed from a fraction of a second to nearly a complete press cycle. Two sizes of these limit switches are available, the smaller holding up to twelve cams and the larger up to twenty-two.

Miniature Hydraulic Valves

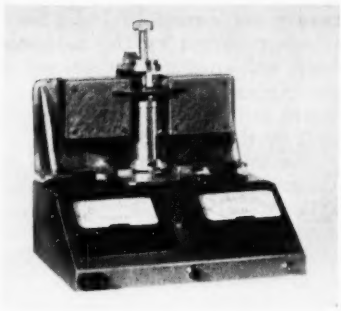
Miniature hydraulic valve, designated the V10-1000, recently announced by the Skinner Electric Valve Division of the Skinner Chuck Co., Dept. M, 206 Edgewood Ave., New Britain, Conn. This compact unit can be utilized as a two- or three-way valve in either the normally open or closed position. Principal application for this valve will be found in the automatic operation of single- and double-acting hydraulic cylinders or for pilot control of large three- and four-way hydraulic valves. It is capable of handling hydraulic fluids at pressures up to 1000 pounds per square inch. All internal parts are stainless steel. The slide mechanism has a precision-ground piston and a bore held to extremely close tolerances. The ports are threaded for 1/8-inch pipe and have an effective orifice diameter of 3/32 inch. The valves are available for operation on the full range of alternating-current or direct-current voltages.





Huppert Precision Heat-Treating Furnace

High-temperature electric box type heat-treating furnace brought out by the K. H. Huppert Co., Dept. M, 6830 S. Cottage Grove Ave., Chicago 37, Ill. This Model KR is built in five different sizes, from 6 inches wide by 6 inches high by 9 inches deep, to 10 inches wide by 8 inches high by 18 inches deep. The furnace has a new skirt type cabinet, and is furnished with transformer, contactors, switch box, and electric indicating temperature controller.

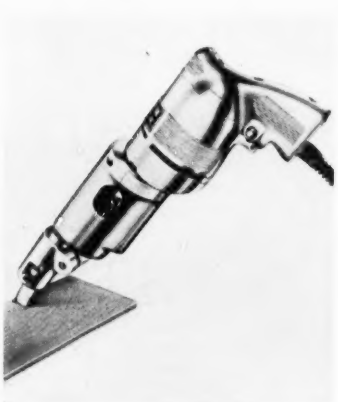


Torque Tester for Precision Ball Bearings

Torque tester designed to fill the need for a rapid responding tester for comparing breakaway, starting, and running torque; evaluating race roughness; and detecting dirt in precision ball bearings. In operation, one control enables the operator to raise the voltage on an eddy current motor until it just starts the bearing. At this point, a reading on a meter gives a comparative measure of starting torque while at reduced voltage a steady running torque is shown. On another meter at a selected speed, amplified signals generated by race roughness and dirt indicate bearing quality. Product of the Baker Co., Inc., Dept. M, Maplewood, Maine.

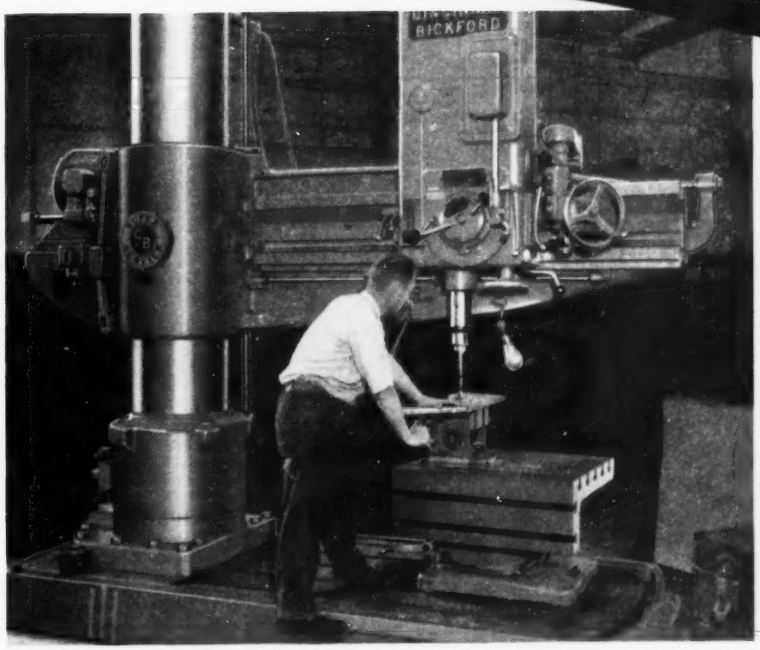
Sawing Attachment for Portable Electric Drill

"E-Z Cut" attachment applied to 1/4-inch portable electric drill to convert it into a power saber saw that can be used for heavy-duty sawing of metal, wood, plastics, and composition board. The attachment can be locked rigidly to the nose of the drill housing. Chisels, jig saws, files, rasps, and other cutting tools can also be used





super service FOR "egg beaters"



Photographs courtesy of the Piasecki Helicopter Corporation.

These Helicopters for Army, Navy and Air Force are being produced to exacting accuracies at the Piasecki Helicopter Corporation at Morton, Pennsylvania. A Cincinnati Bickford Super Service Radial Drill was selected for its accuracy, speed and easy handling as part of a current cost-reduction program used in the jig and fixture department producing tools for the Egg Beaters.

Write for catalog R-29.

CINCINNATI
BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

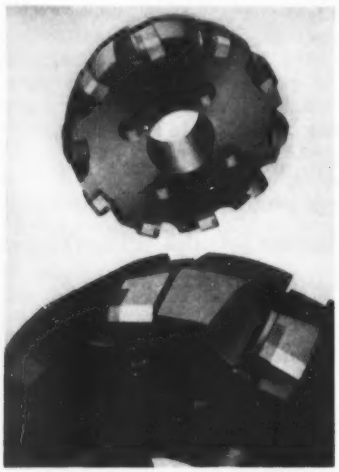
THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

in the attachment. Adapter rings are available for applying the attachment to most 1/4-inch electric drills having a speed of 1700 to 3000 R.P.M. and an amperage power rating of 1.7 H.P. or more. Product of Jaco Devices, Inc., Dept. M, 97 High St., Hingham, Mass.

Face-Milling Cutter and Shell End-Mill

Kroslok face-milling cutter and shell end-mill designed by the Motch & Merryweather Machinery Co., Cutting Tool Mfg. Division, Dept. M, Penton Bldg., Cleveland 13, Ohio. Three basic members compose these cutters—body, blade, and wedge. Cross serrations on one side of the body channel mate with similar cross serrations on the blade, assuring rigid holding of the blade in the body. The wedge is driven between the smooth side of the body channel and blade after the cross-serrated pattern is aligned. There are two basic types of bodies: general-



purpose and heavy-duty, both for ferrous and non-ferrous applications. Right- and left-hand bodies and blades are offered. The blades are available in high-speed steel, and with cemented-carbide tips. Blades are interchangeable in the same body types. Diameters range from 3 through 24 inches.

Ortho-Weld Magnifying Lenses for Welders

The Ortho-Weld magnifying lens, shown being inserted in the holder of a welder's helmet, is a new device designed to improve the vision of welders who wear bifocal glasses. This precision lucite lens is manufactured by the Bausch & Lomb Optical Co., Dept. M, 635 St. Paul St., Rochester, N. Y. It will fit all standard welding helmets and provide comfortable close-up vision at any angle. The magnification is needed because the bifocal segment of regular

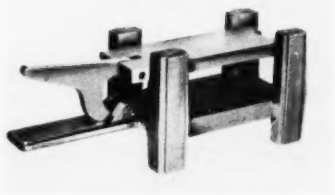


glasses is out of the line of vision when the welding helmet is in the working position.

Rollway Heavy-Duty Thrust Bearing

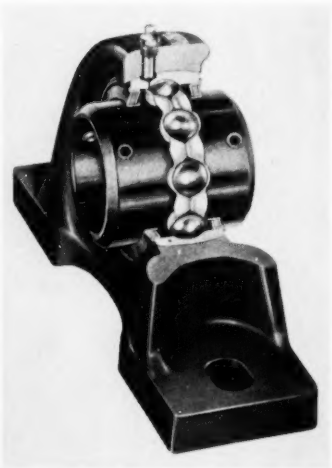
High-capacity thrust bearing for heavy-duty applications on extruders, generators, and pulverizers brought out by the Rollway Bearing Co., Inc., Dept. M, Seymour St., Syracuse, N. Y., subsidiary of Lipe-Rollway Corporation. A new type of retainer with long roller slots of five rollers each arranged alternately with short roller slots of four rollers each serves to increase the load capacity of these bearings by approximately 9 per cent and their life by about 29 per cent. The roll retainer is of bronze which is centrifugally cast by a process that eliminates voids or blow-holes along the roller slots.





Wespo Leaf Jig

Leaf jig for drilling, tapping, and reaming operations announced by the West Point Mfg. Co., Dept. M, 26935 W. 7 Mile Road, Detroit 19, Mich. This jig is made ready for use by providing a locating nest for the part and inserting drill bushings. The jig has a precision-made steel lid, a clamping cam, and a semi-steel body with the parallelism between the lid and machined base held to 0.002 inch. The jig can be used in any position—top, bottom, or on either of the two sides. The jig is made in eleven base sizes of 1 1/2 by 2 inches to 6 by 6 inches.

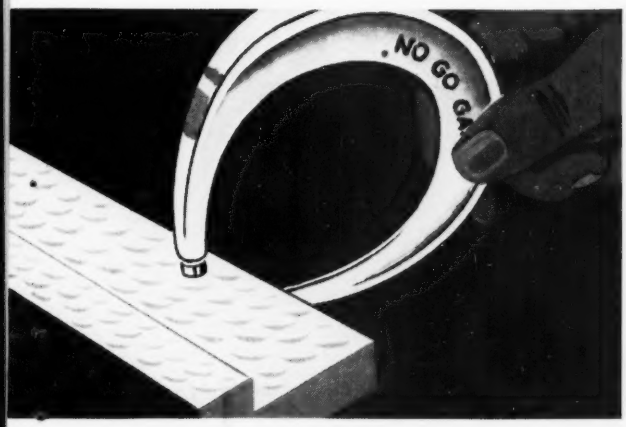


Zone-Hardened Bearings with Double-Extended Race

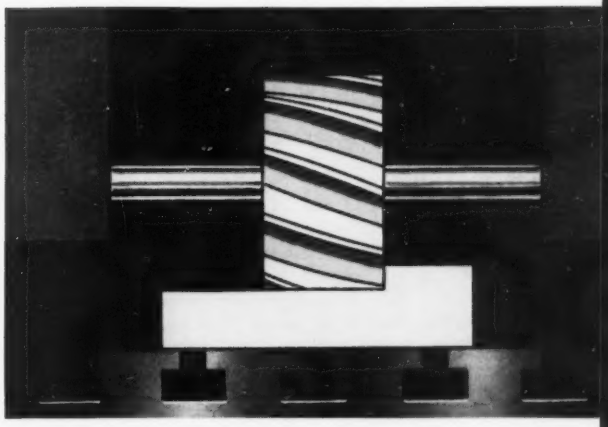
Zone-hardened Sealmaster ball-bearing unit with double-extended race now being manufactured by the Sealmaster Division of the Stephens-Adamson Mfg. Co., Dept. M, Aurora, Ill. The process of zone hardening applied to this bearing consists of induction heat-treating the inner race ring through the ball path section only. Since the extended portions of the race remain unaffected, the hardened threads of the set-screws are able to bind tightly against the soft threads of the race, positively locking it to the shaft.

HOW TO END DAMAGED WAYS, PRODUCTION LOSSES

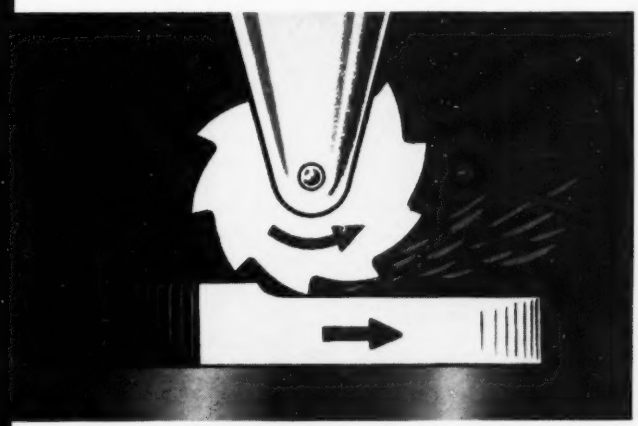
Sunoco Way Lubricant Stops "Jumpy Table"



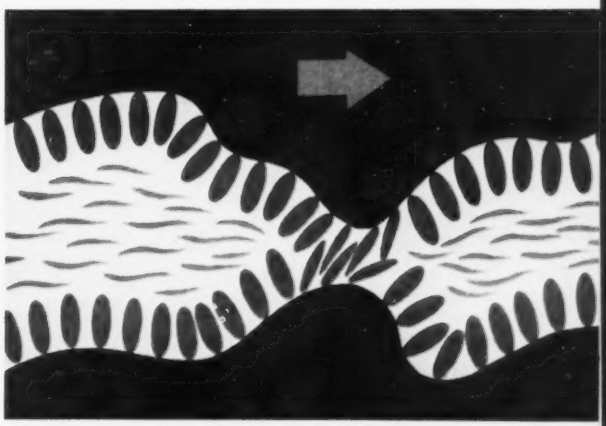
Tool chatter and jumpy table are machining headaches. Too often they cause poor surface finish, failure to hold tolerances, production losses.



Tool chatter is a result of a lack of rigidity in either the machine or the set-up. It is a mechanical problem and no lubricant can lick it.



Jumpy table is a stick . . . slip . . . stick . . . slip action of the table. It is a lubrication problem. Though just as damaging as tool chatter, it is not always detected when the cause of poor surface finishes.



Extreme magnification

Sunoco Way Lubricant cures jumpy table. It contains special compounds that form a film, like the nap of a rug, on the sliding surfaces and minimize the force of both static and kinetic friction.

Why take a chance of damaging your ways? These integral parts of the base casting for your machine are difficult to refinish and costly to replace. For information about Sunoco Way Lubricant, call a Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. M-12.

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY

SUNOCO®

PHILADELPHIA 3, PA. ◆ SUN OIL COMPANY LTD., TORONTO & MONTREAL

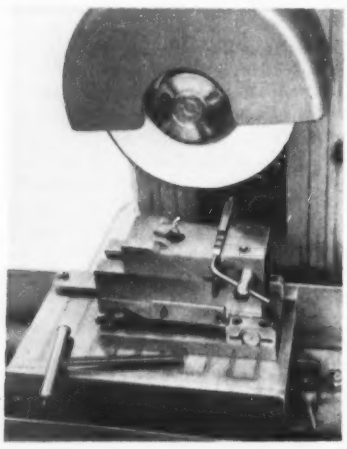


Light-Duty Ball-Bearing Pillow Block

Light-duty, ball-bearing pillow block of series designated Type PB recently put in production by the Fafnir Bearing Co., Dept. M, New Britain, Conn. These pillow blocks are a complete, ready-to-mount, economy package, which includes a separable two-piece pressed steel housing, a prelubricated Fafnir wide inner ring ball bearing with self-locking collar, and "Plya-Seals." The housing occupies a minimum of space and is designed to provide initial self-alignment in all directions and to assure ample strength for the light-duty applications for which it is recommended. The "Plya-Seals" provide efficient grease retention and contaminant exclusion to minimize maintenance.

J & S "Square Perfect" Precision Grinding Vise

Vise that is square within 0.0001 inch or less per inch in four positions recently announced by the J & S Tool Co., Inc., Dept. M, 644 W. Mt. Pleasant Ave., Livingston, N. J. This "Square Perfect" vise has an adjusting stop and a hold-down feature which is said to give dependable, accurate positioning of work-pieces. The clamping jaw swivels to permit holding tapered and odd-shaped work-pieces. It holds round stock from 1/16 inch to 2 1/2 inches in diameter and is attachable to angle-plates. The range of jaw openings is from 0 to 3 inches.



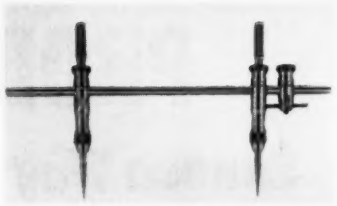
Two-Step Time Delay Relay

One of four new Agastat time delay relays announced by the A'G'A Division, Elastic Stop Nut Corporation of America, Dept. M, 1027 Newark Ave., Elizabeth, N. J. This relay is designed for control circuits requiring two time delay steps, or momentary impulses. A typical two-step delay application would be the sequential starting of electric motors, and a typical impulse application would be the operation of solenoid valves of air cylinders on indexing mechanisms. The pneumatically controlled overall time delay is adjustable from one-tenth of a second to 10 minutes. An auxiliary switch provides two timing steps and can be adjusted to operate up to fifteen seconds after the start of the overall time delay period. Many different operation controls are possible, from momentary impulses to complex delay contact sequences.



Lufkin Steel Beam Trammels

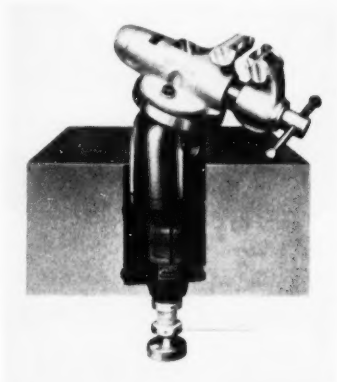
Steel beam trammels made by the Lufkin Rule Co., Dept. M, Saginaw, Mich., to provide an easy-to-use tool for lay-out work, scribing, and measuring. Free-turning knurled grips on the top of each tram make the tool easier to use.



The trammels will not turn when clamped to the rigid beam that is flattened on the top side. Spring friction prevents the trammels from sliding off the beam when the clamping nuts are loosened. The hardened scriber points can be accurately set by a fine-thread adjusting screw. The trammel beams are available in lengths of 10 1/2, 14 1/2, and 20 inches. With a 20-inch extension beam, circles up to 72 inches in diameter can be scribed with the 20-inch trammel.

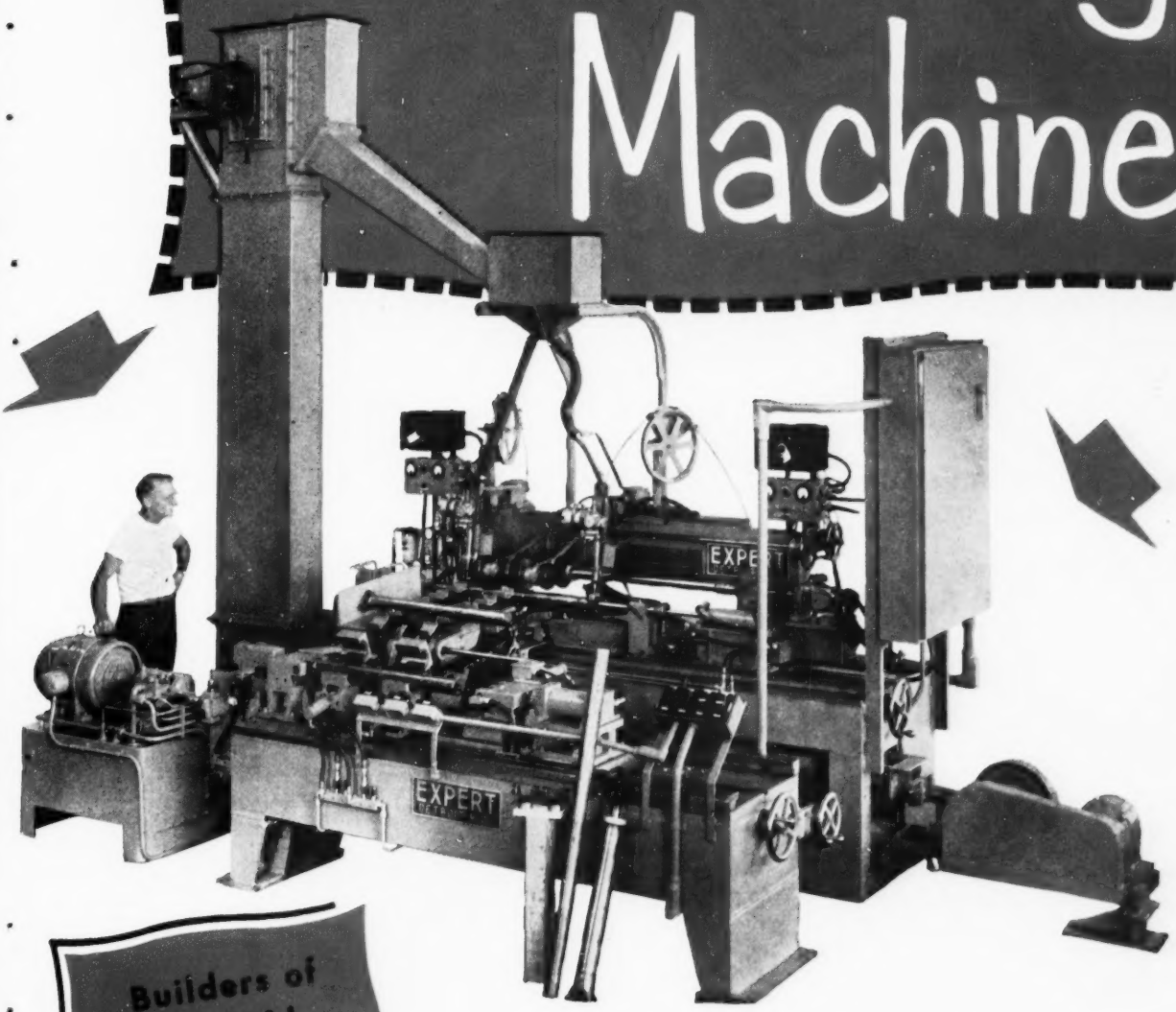
Wilton Heavy-Duty Hydraulic "PowRarm" for Holding Large Work

Heavy-duty hydraulic "PowRarm" with carrying capacity of 1000 pounds just announced by the Wilton Tool Mfg. Co., Dept. M, 925-941 Wrightwood Ave., Chicago 14, Ill. This unit is especially adapted for use in foundries for positioning large castings for filing and chipping. It can be used vertically, as illustrated, horizontally, or mounted to the side of a work-bench. There is a slotted base for use with drill presses, shapers, and milling machines for machining operations at compound angles. Its hydraulic action permits an operator to make a change of position under partial clamping tension, to prevent work from accidentally falling.



AUTOMATIC SUBMERGED

Arc Welding Machine



Builders of SPECIAL MACHINES for EVERY PURPOSE

This specially designed machine welds Universal Fittings and Splines into fifteen various length Propeller Shafts . . . Included in the unit is a press for fitting the yoke into the tube prior to being conveyed into a welding position.

FOR FURTHER INFORMATION CONTACT

EXPERT WELDING MACHINE CO.

17144 MT. ELLIOTT AVE. • DETROIT 12, MICH. • PHONE TWINBROOK 1-4327



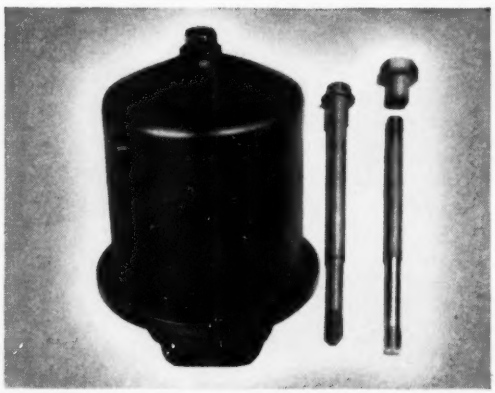
Here's where Purolator screened out rising costs

● Purolator makes oil filters for a prominent auto maker. They're top-notch filters that do a tough job well. Purolator and the car manufacturer are both proud of them.

Not long ago an RB&W "fastener engineer" got loose in the Purolator plant—just when company production executives were looking for a way to lick rising costs. He noticed that the Purolator filter was being assembled with a two-piece fastener made slowly and laboriously on a screw machine.

Our man told the Purolator people about RB&W's batteries of cold-forming machines. Purolator wanted to know more. Now their filter is assembled with a one-piece RB&W fastener that costs far less to make and assemble.

Chances are you can find a stage in your operations where RB&W "fastener engineering" can help you keep costs in line. As a leading manufacturer of all kinds of fasteners, we're always able to recommend and supply the right ones for all your needs. Write RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY, Port Chester, N. Y.



EASIER, FASTER ASSEMBLY undercut high costs when Purolator switched from a two-piece fastener *(right)* to an RB&W-designed cold-formed fastener *(left)* for its famous oil filter.

RB&W

108 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

Plants at: PORT CHESTER, N. Y., CORAOPOLIS, PA., ROCK FALLS, ILL., LOS ANGELES, CALIF. *Additional sales offices at:* PHILADELPHIA, PITTSBURGH, DETROIT, CHICAGO, DALLAS, SAN FRANCISCO. *Sales agents at:* PORTLAND, SEATTLE. *Distributors from coast to coast.*

(For more information on products advertised, use Inquiry Card page 247)

PRODUCT INFORMATION SERVICE

Use postage-free Business Reply Card below for further information
On New Catalogues described in this issue of MACHINERY
On products mentioned in the editorial pages
On products shown in the advertisements

NEW CATALOGUES

CARBIDE TOOLS—Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill. Catalogue on forty different carbide-tipped tools. Complete information and specifications are given on drills, reamers, masonry drills, glass drills, shell reamers, lathe centers, countersinks, gun drills, special tools, and tool bits. A chart of carbide grades is included. Can be obtained when requested on a company letterhead direct to the above address.

TURRET LATHE WALL CHART—Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis. Wall chart 24 by 36 inches entitled "Nomenclature of a Saddle Type Turret Lathe," indicating by numbers and arrows the sixty-three machine features of the Gisholt 3L saddle type turret lathe. A decimal equivalent list is also presented on the chart. Can be obtained when requested on a business letterhead direct to the above address.

LATHES AND SHAPERS—Logan Engineering Co., Lathe Division, Lawrence and Lamon Aves., Chicago 30, Ill. Catalogue featuring Logan lathes and shapers and their accessories and, in particular, the new 12-inch swing lathe. Catalogue available when requested on a company letterhead to the above address.

FLAME-HARDENING CONTROL — Cincinnati Milling Machine Co., Cincinnati, Ohio. Catalogue M-1824, descriptive of the new Cincinnati Flamatic power control unit—a central unit for the precise control of gas and oxygen for various selective hardening operations. The unit also controls pressure of water for cooling and quenching; air for actuating cylinders; and electrical power for automatic work movements and operational cycling. 1

MACHINE TOOL LUBRICATION—D. A. Stuart, Ltd., Chicago, Ill. Manual entitled "Shop Notebook," containing 58 pages of technical information on machine tool lubrication. Among the subjects considered are cutting fluids for high-speed screw machines, for tapping and threading, for gear cutting, and for multiple-spindle automatic screw machines; and oils for broaching. 2

BLAST CLEANING—Pangborn Corporation, Hagerstown, Md. Bulletin 1500, explaining the possibilities of blast cleaning to executives and engineers requiring comprehensive information on this subject, such as the economics of blast cleaning; the modern blast cleaning machine; and kinds of abrasives. A list of applications is furnished, along with a glossary defining the terms used. 3

COLD-ROLLED ALUMINUM STRIP — Scovill Mfg. Co., Waterbury, Conn. Booklet presenting technical data on Truspec, a cold-rolled aluminum strip manufactured by the company —fabricating characteristics; standard temper designations; gage comparisons; and conversion factors and definitions. 4

AUSTENITIC STAINLESS STEELS—International Nickel Co., Inc., New York City. Bulletin A-49, entitled "Corrosion-Resisting Properties of the Austenitic Chromium-Nickel Stainless Steels," presenting eighteen tables that show the results of corrosion tests on numerous austenitic stainless steels in various solutions, with interpretations of the data. 5

PRECISION LATHES—Monarch Machine Tool Co., Sidney, Ohio. Booklet 502 on the Monarch 13-inch Model EE precision lathe for both manufacturing and tool-room applications, and in particular describing six new design advances incorporated in the machine. Copies of the booklet are available to production, engineering, and purchasing executives. 6

CUT-OFF WHEELS—Norton Co., Worcester, Mass. Revised booklet entitled "Norton Cut-Off Wheels," consisting of a 36-page instructive manual giving up-to-date information on various types of cutting-off machines and abrasive cut-off wheels. Included are helpful tables for wheel selection and conversion of wheel speeds to feet-per-minute values. 7

SPECIAL MACHINERY AND TOOLING—Kearney & Trecker Corporation, Milwaukee, Wis. Bulletin giving a complete description of the company's Special Machinery Division—its customer engineering service and equipment. Illustrated are some of the special machines already designed and built by the Division to provide solutions to big and small metal-working problems. 8

METAL-WORKING PROCESSES — Continental Copper & Steel Industries, Inc., New York City. 87-page manual entitled "Metal at Work," describing and illustrating the work of the seven divisions of the company. The manufacturing processes of each unit are explained in detail, and the varied products are shown in step-by-step operational photographs. 9

METAL FABRICATING FACILITIES—R. C. Mahon Co., Detroit, Mich. Booklet entitled "A Picture Story of the R. C. Mahon Co.," consisting of a 46-page description of the company's extensive metal fabricating facilities, products, and services. Production methods of the eight divisions are treated separately. .. 10

TRACER-CONTROL MILLING—Pratt & Whitney Division, Niles-Bement-Pond Co., West Hartford, Conn. Circular 565, descriptive of the Pratt & Whitney new type BG-21 Keller machine. Illustrated are design features of this automatic tracer-controlled milling machine, which handles a wide variety of jobs without requiring major adaptations. 11

HEATING ELEMENTS—Norton Co., Worcester, Mass. Booklet 146 on the new "Hot Rod" Crystolon heating elements for electric furnaces and kilns, covering such subjects as expected service life, operating temperatures, mounting methods, power consumption and electrical data, and operating suggestions. A temperature conversion chart is included. .. 12

PRESSURE PLUGS—Standard Pressed Steel Co., Jenkintown, Pa. Bulletin on Unbrako Dryseal-Thread pressure plugs, which seal tight without sealing compound by crushing crests and roots in softer threads of mating tapped parts. Data on standard sizes, from 1/16 inch to 1½ inches, are listed. 13

SPIRAL MILLING ATTACHMENT—Cincinnati Milling Machine Co., Cincinnati, Ohio. Publication M-1816, featuring the Cincinnati heavy-duty universal spiral milling attachment for miscellaneous milling operations requiring the cutter-spindle adjusted to any angle in the horizontal or vertical planes. 14

CARBIDE CUTTING TOOLS—Super Tool Co., Detroit, Mich. Catalogue 54, containing 92 pages listing the Super line of standard carbide cutting tools—milling cutters, end-mills, reamers, drills, single-point tools, and ejector tools. Illustrated also are various types of special carbide tools. 15

TOGGLE SWITCHES—Micro, a Division of Minneapolis-Honeywell Regulator Co., Freeport, Ill. Data Sheets P72, P81, P82, and P83 on new toggle switch designs. Data Sheet 90 on protected Honeywell mercury switches designed for use in locations where ordinary glass tube mercury switches are subject to damage. .. 16

REPRODUCTION MATERIALS—Eastman Kodak Co., Rochester, N. Y. Booklet entitled "Modern Drawing and Document Reproduction," giving basic information on Kodagraph reproduction materials for use in engineering, industrial, and other fields. A materials selection chart is included. 17

MEASURING INSTRUMENTS—DoAll Co., Des Plaines, Ill. Catalogue 51-810 on Tumico precision measuring instruments. The extensive line of tubular micrometers is concisely covered, as well as dial indicators, height gages, comparators, and other measuring instruments. 18

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COPPER-BASE ALLOYS—International Nickel Co., Inc., New York City. Bulletin A 107-8, describing the Ni-Vee bronzes, a family of low-shrinkage, heat-treatable bronzes for machine component pressure and bearing castings. Typical compositions and applications are given. 19

INDUSTRIAL TRAINING—South Bend Lathe Works, South Bend, Ind. Bulletin 5329, describing all of the company's instructor-student aids—books and charts on machine shop practice; scale models for three-dimensional shop planning; and motion pictures on lathe operation. 20

DEW POINT CONTROLLER—Ipsen Industries, Inc., Rockford, Ill. Leaflet C-21 describing the company's new metal-treating development, the Ipsen dew point controller, which automatically indicates, records, and controls dew point in controlled-atmosphere heat-treating furnaces. 21

MACHINING COPPER AND COPPER BASE ALLOYS—American Brass Co., Waterbury, Conn. Publication B-3, consisting of practical suggestions for machining copper, brass, bronze, and nickel silver in which cutting tool materials, cutting speeds and feeds, tool rakes, and clearances are considered. 22

MINIATURE HYDRAULIC VALVES—Skinner Electric Valve Division, Skinner Chuck Co., New Britain, Conn. Bulletin 529, giving details on the V10 series miniature hydraulic valves for the automatic control of hydraulic systems at pressures up to 1000 pounds per square inch. 23

BROACHING MACHINES—Colonial Broach Co., Detroit, Mich. Bulletin 877, consisting of a condensed review of the twelve basic types of machines manufactured by the company, as well as the many broaching services provided. In addition, Colonial Broach sharpeners are described. 24

END WHEEL PRESSES—E. W. Bliss Co., Canton, Ohio. Catalogue 4-A, giving technical information on the Bliss No. 30 series of end wheel presses designed for punching, shearing, cutting out, and forming blanks of heavy metal such as steel, iron, and brass. 25

SHELL TRIMMING MACHINES—Dayton Rogers Mfg. Co., Minneapolis, Minn. Form 25-B, showing applications of the Dayton Rogers universal shell trimmer for the finishing of circular, square, and rectangular drawn shells with small corner radii. 26

MAGNETIC CHUCKS—Taft-Peirce Mfg. Co., Woonsocket, R. I. Catalogue 411, containing comprehensive data on the company's line of electromagnetic chucks. General information concerning applications and advantages of magnetic chucking is given. 27

SILICON CARBIDE—The Carborundum Company, Niagara Falls, N. Y. 52-page manual entitled "Facts About Silicon Carbide," in which the properties and varied uses of silicon carbide are considered, and manufacturing techniques outlined. A bibliography is also given. 28

TUNGSTEN ALLOY—Firth Sterling, Pittsburgh, Pa. Bulletin 101, featuring Firth Heavy Metal, a new high-density tungsten material with small amounts of nickel and copper added to aid machinability. Typical applications are described. 29

GEAR BURRING AND CHAMFERING MACHINE—Modern Industrial Engineering Co., Detroit, Mich. Bulletin 103-60, descriptive of the Burr-Master, a universal deburring and chamfering machine available in eight models, providing an operating size range from ⅜ inch to 9½ inches pitch diameter. 30

AIR-DRIVEN GRINDING ATTACHMENT—Vulcan Tool Co., Dayton, Ohio. Manual giving information on various grinding applications of the Vulcanaire high-speed spindle, together with specific operating instructions. 31

TAPS—Detroit Tap & Tool Co., Base Line, Mich. Bulletin ST-53, giving tap sizes, thread forms, and descriptions of the company's Specific taps, which have been standardized for various materials—steel, cast iron, aluminum, zinc die-cast metals, brass, and plastic. 32

TOOL DRESSING EQUIPMENT—Lobdell United Co., Wilmington, Del. Folder describing a tool dressing "package," consisting of the Nazel electropneumatic forging hammer; Eclipse pot furnace, quench tank, and tempering furnace; and Black & Decker tool grinder. 33

SINGLE-SPINDLE AUTOMATICS — Cleveland Automatic Machine Co., Cincinnati, Ohio. Bulletin descriptive of two new Cleveland machines—the 4¼- and 5¾-inch Model AB single-spindle automatic, and the 4¼-inch Model AW—presenting features and specifications. 34

TOOLS AND ACCESSORIES FOR PAVING BREAKERS—Ingersoll-Rand Co., New York City. Form 4126, describing and illustrating I-R tools and accessories for paving breakers. Specific instructions are given for the reconditioning of mail point steels. 35

UNIVERSAL TESTING MACHINE—Baldwin-Lima-Hamilton Corporation, Philadelphia, Pa. Bulletin 4206, containing comprehensive information on the structure and scope of the SR-4 universal testing machine. 36

GEAR CHECKING—Michigan Tool Co., Detroit, Mich. Bulletin 1136-53, descriptive of the Model 1136 Sine-Line involute checker for spur and helical gears up to 36 inches in diameter. 37

CUTTING TOOLS—Motch & Merryweather Machinery Co., Cleveland, Ohio. Bulletin 101-CT, describing the Kroslok inserted-blade face mills and shell end mills for steel, cast iron, and aluminum. 38

TRI-CLAD MOTORS—General Electric Co., Schenectady, N. Y. Three bulletins—GEA-6013, covering the G-E line of Tri-Clad dripproof motors from 1 to 30 H.P.; GEA-6012, describing enclosed motors; and GEA-6027, featuring new gear-motors. 39

PYROMETER CALIBRATION DATA—Bristol Co., Waterbury, Conn. Bulletin P1259, consisting of new tables on pyrometer thermocouple calibration data based on information recently released by the National Bureau of Standards. 40

PIERCING UNITS—Toolset, Division of General Riveters, Inc., Buffalo, N. Y. Catalogue giving prices and specifications of Toolset piercing units—round hole series, heavy-duty piercing units, and notching units. 41

FLUID POWER EQUIPMENT—Oilgear Co., Milwaukee, Wis. Bulletin 10051-C, illustrating and describing the company's complete line of fluid power pumps, motors, transmissions, cylinders, and valves. 42

SERVO COMPONENTS—Minneapolis-Honeywell Regulator Co., Philadelphia, Pa. Data Sheet 10.20-3a, descriptive of Brown amplifiers, converters, and motors adaptable to a variety of servo loops and electromechanical systems. 43

PERMANENT MAGNETS—Carboloy Department of General Electric Co., Detroit, Mich. Technical Report PM-111, giving latest information on the uses, design, properties, and manufacture of Alnico permanent magnets, sintered Grade 5. 44

CARBIDE BLANKS AND CYLINDERS—Adamas Carbide Corporation, Harrison, N. J. Bulletin listing semi-standard carbide blanks and solid carbide cylinders available. 45

DIE-CASTING MACHINES—Lake Erie Engineering Corporation, Buffalo, N. Y. Bulletin 23-2, describing in detail the company's complete line of die-casting machines. Capacity and pressure tables are given. 46

DRILLING AND TAPPING MACHINES—Edlund Machinery Co., Cortland, N. Y. Bulletin 130, giving essential data on the company's vertical-motor, cone-pulley, drive, drilling and tapping machines in three models. 47

ELECTRONIC EQUIPMENT — Westinghouse Electric Corporation, Pittsburgh, Pa. Booklet B-6093, comprising a convenient summary of equipment available for use in the communications and electronics industries. 48

GENERAL-PURPOSE LATHE—Hendey Machine Co., Inc., Torrington, Conn. Specification Sheet 1035, giving details on the No. 2E 14-inch general-purpose precision lathe with electronic motor control. 49

AUTOMATIC TURRET LATHE—Potter & Johnston Co., Pawtucket, R. I. Bulletin 131, giving specific information on the P & J 5-D Power-Flex automatic turret lathe. 50

AIR AND HYDRAULIC CONTROL VALVES—C. B. Hunt & Son, Inc., Salem, Ohio. Catalogue 531, describing the Quick-As-Wink line of air and hydraulic control valves. 51

WELDING—Lincoln Electric Co., Cleveland, Ohio. Booklet entitled "The Case of the Ailing Weldollar," suggesting the Lincoln plan for reducing welding costs. 52

PUNCH PRESSES—Kenco Mfg. Co., Los Angeles, Calif. Folder illustrating the company's line of 4- and 5-ton punch presses, swivel base vises, and rotary tables. 53

Product Information Service

Use postage-free Business Reply Card below for further information concerning New Catalogues described in this issue and products mentioned in the editorial pages or advertisements.

Circle numbers of the catalogue items in which you are interested.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
46	47	48	49	50	51	52	53							

For more details on products mentioned in the editorial pages or shown in the advertisements in this issue, fill in below:

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This card is void after March 1, 1954 M-12/53

ANOTHER NEW FAFNIR...

Ball Bearing "Economy Package"



Type PB
Pressed Steel
Pillow Block

The new Type PB Series Pillow Block is developed to fill a specific need for a high-quality, precision ball bearing unit at the lowest possible cost. It is made for *light duty* applications where a low-cost "packaged" unit offers definite manufacturing and servicing advantages . . . on agricultural equipment, conveyors, light-duty fans and similar types of machinery involving the transmission of power.

The Type PB Series Pillow Block opens up new opportunities to add extra product sales features and to lower maintenance costs . . . another example of the Fafnir "attitude and aptitude". Send for new, descriptive bulletin. The Fafnir Bearing Company, New Britain, Conn.

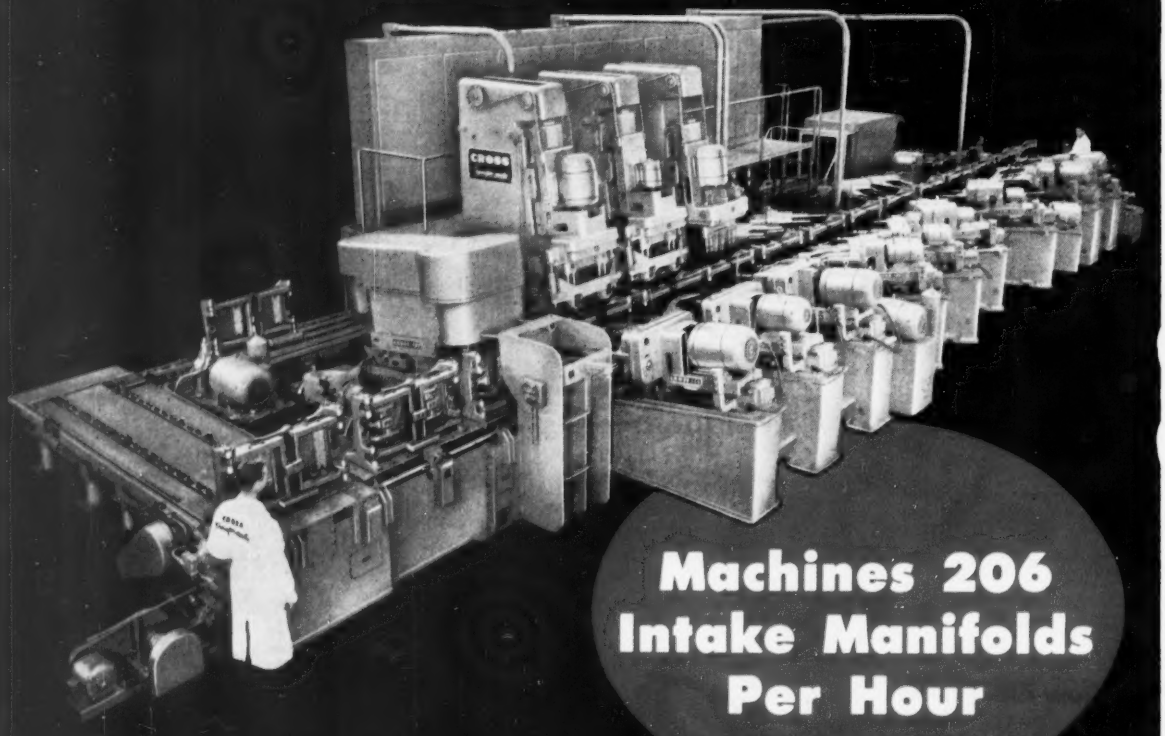
OUTSTANDING FEATURES

- Low Cost
- Precision Ball Bearing . . . Fafnir Wide Inner Ring Bearing* with Self-locking Collar and efficient Plya-Seals.
- Two-piece separable pressed-steel housing.
- Self-aligning . . . unrestricted in all directions at assembly.
- Occupies less space than other pillow blocks.
- Light weight . . . combined with ample strength.
- Only two bolt holes required in assembly.
- Ample capacity for radial, thrust or combined loads.
- Pre-lubricated with long-life grease.
- Available for shaft sizes ½" to 1¼" inclusive.

*Easiest bearing of all to install. Counterbored, eccentric, mated cam construction of collar and inner ring assures positive locking action without set screws, lock nuts or adapters.

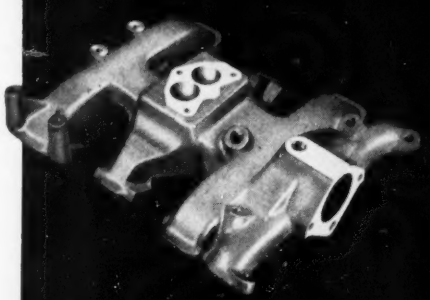
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BALL BEARINGS
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Another Transfer-matic by Cross



Machines 206 Intake Manifolds Per Hour

- ★ Two parts machined at one time in each station.
- ★ 100 operations—two milling, 48 drilling, four boring, 20 chamfering, four spotfacing, and 22 tapping.
- ★ 14 stations—one loading, one unloading, 12 working.
- ★ Palletized work holding fixtures with power wrenches for automatic clamping.
- ★ Integral conveyor for automatic return of palletized fixtures from unloading to loading station.
- ★ Other features—automatic chip removal; hardened and ground ways; automatic lubrication system; J. I. C. standard construction.



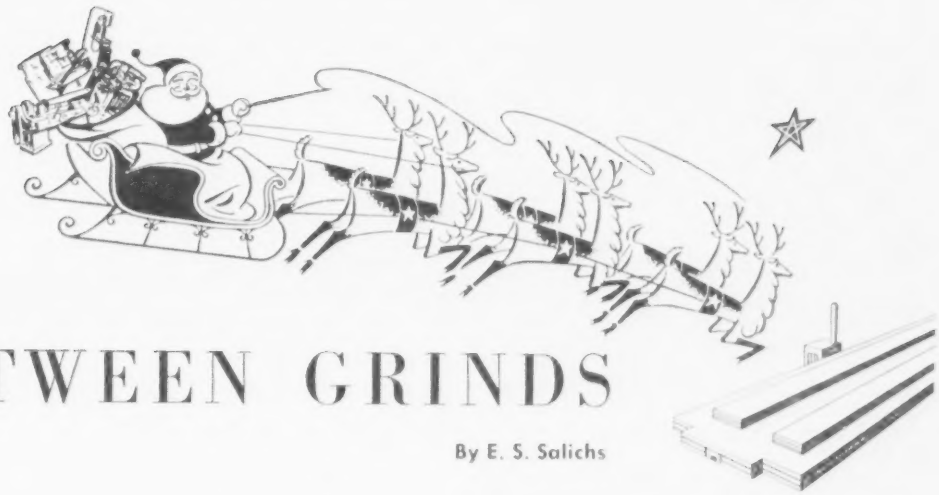
Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

For more information on products advertised, use Inquiry Card page 247



BETWEEN GRINDS

By E. S. Salichs



Our printer, in submitting some type samples this year, inadvertently labeled this page* Between Friends. *And here we stand ready to throw the first friendly snowball, wishing Machinery's readers the Joys of the Season—A Very Merry Christmas!

Arabian Nights and Days

A notice reached us that Westinghouse air conditioners will soon cool and heat Badia Palace in Saudi Arabia, where the temperature often reaches 130 degrees F. in summer and goes below freezing in winter. Also to be favored with this system will be Sheik Suliman, Minister of Finance, the assumption being that it might help to keep the country's economy stable if the Minister's disposition is likewise.

Try Us Out—We'll Tell You

An advertisement for Sheboygan's sausages as a holiday gift was duly noted. It specified "Made with or without garlic. Tell us which."

Crystals on the Cuff

Punch press operators at a United Air Lines maintenance base wear wristbands that contain radio-active crystals. If an operator's hands should stray into danger, Geiger tubes that enclose the punching area pick up radiation and halt the machine. Since the punch press will not run unless the operator is equipped with wristbands, he can't, like rubbers, just forget to put them on. Hazatrol, Inc., Berkeley, Calif., designed the safety device.

A Wordventor?

Some writers go around crossing words like Burbank crossed berries. We have just encountered a man who chatted about technibberish—in other words, technical rubbish.



Touchy on Tea

For years the employes at the Sheffield machine tool factory in England brewed their own tea midmorning and midafternoon, supplying their own tea, milk and sugar and getting boiling water from the gas boilers at the plant. The management offered recently to provide free cups of tea twice a day, in an efficiency move. But the plant's union protested: "To deny them the right to make tea in their own time is taking away their liberties." Strike.

What the Auto Pioneers Drove

The Detroit Public Library recently unearthed a copy of a 1904 census of the city's automobile owners, according to *Automobile Facts*. The census not only listed the owners but their cars as well. The automobiles had such unfamiliar names as Blomstrom, Clark, Columbia, Detroit Touring Car, Geneva, Lenawee, Little Four, Marr, Niagara, Northern, Reliance, Waverley, and De Tour. The last-named probably also described the situation.

Just to Say—Get Going

A gay greeting card of the type mostly used by women for friendly personal notes was recently received by the manager of our book department. But the correspondent had merely reached for the first letter paper handy to convey his message: "Dear Sir: The picture on the opposite side is not funny. I am just asking why I do not get my MACHINERY'S HANDBOOK which I ordered and paid for." For sure it's in the mail.

The Bite in the Bush

Snakeproof trousers can now be had—so that the snake can't have you. The trousers are made by the Gokey Co. of heavy canvas with a detachable lining of Monel wire cloth.



And a Very Happy New Year!

News OF THE INDUSTRY

Illinois and Indiana

NATIONAL METAL TRADES ASSOCIATION, Chicago, Ill., at its recent annual convention elected the following officers: President, EARLE S. DAY, vice-president and general manager of the Collyer Insulated Wire Co., Pawtucket, R. I.; vice-president, NORMAN L. ROWE, vice-president of the Ideal Roller & Mfg. Co., Long Island City, N. Y.; and second vice-president and treasurer, WALTER F. NEWHOUSE, vice-president and general manager of the Saranac Machine Co., Benton Harbor, Mich.

SKIL CORPORATION, Chicago, Ill., manufacturer of portable electric and pneumatic tools, announces a change in address for four of its branch offices as follows: New York City—2800 Park Ave.; Baltimore, Md.—2323 Greenmount Ave.; Portland, Ore.—5616 N. E. Glisan St.; and Indianapolis, Ind.—620 E. Riverside Drive.

PETER S. BLAKE has been named works manager of the new automotive frame plant, Granite City, Ill., being constructed by the A. O. Smith Corporation, Milwaukee, Wis. Mr. Blake was formerly factory manager of the Truck Frame Division at Milwaukee.

JOSEPH OHZOURK has been appointed factory manager of the Chicago, Ill., die mold plant of the United States Rubber Co., New York City. Mr. Ohzourk replaces ESPER A. PETERSEN, who will remain with the company as a consultant.

JAMES A. CLARKE has become the new sales manager of the Admiral Die-Casting Corporation, Chicago, Ill., an affiliate of Portable Electric Tools, Inc.

JOHN B. MITCHELL has been named general sales manager of the Kropp Forge Co., Chicago, Ill.

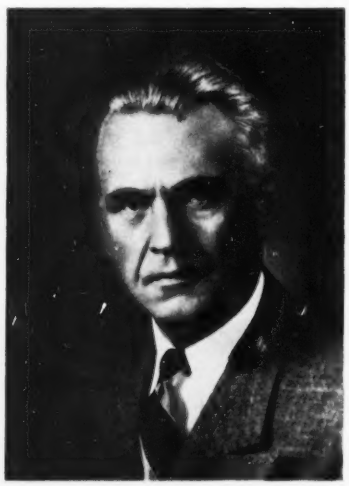
RAY F. ELLIS has been appointed director of sales, and BURLEIGH L. OWENS, director of marketing by the Atkins Saw Division of the Borg-Warner Corporation, Indianapolis, Ind. Until recently, both men were assistants to the vice-president, sales. Mr. Ellis will now be in charge of internal sales functions, and Mr. Owens will direct outside sales.

MANLEY E. LORD, manager of the fractional horsepower motor department at Fort Wayne, Ind., of the General Electric Co., Schenectady, N. Y., recently retired after forty-five years of service with the company. Mr. Lord became department manager in 1947, and prior to that served as Fort Wayne works manager for eight years.

SIDNEY E. GREGORY has been appointed Illinois and Indiana sales representative for the Alloy Precision Castings Co., Cleveland, Ohio. His headquarters are at 2909 Lake Shore Drive, Long Beach, Michigan City, Ind.

Michigan and Wisconsin

WESSON Co., Ferndale, Mich., and WESSON METAL CORPORATION, Lexington, Ky., manufacturers of carbide and carbide cutting tools, recently established a new Experimental Research and Product Development Division. WILLIAM BADER has been appointed vice-president and will be head of the new department. Mr. Bader, who has been associated with the carbide tool industry since 1932, joined Wesson in 1947. At that time, he organized and tooled up the Multicut plant in Brighton, Mich., and since then has worked on product development. Also announced is the creation of a new public relations and advertising department to coordinate programs of the Wesson Metal Corporation, Archer & Smith, Inc., Wesson Multicut Co., Wesson Tool Co., and Wesson Co. The department will be located in the Ferndale office. GREGG MANCHESTER will be head of the new department. He was formerly with the Rolfe C. Spinning Industrial Advertising Agency, Detroit, Mich.



William Bader, vice-president of a new division at Wesson Co. and Wesson Metal Corporation

MICHIGAN TOOL Co., Detroit, Mich., announces the appointment of five representatives for its Shear-Speed Chemical Products Division: J. R. ARMSTRONG, 919 Fletcher Trust Bldg., Indianapolis 4, Ind.; COLONIAL TOOL Co., Box 289, Walkerville Post Station, Windsor, Ontario, Canada; VINCENT L. KENNEDY, 754 Woodlawn, Jackson, Mich.; MOEN SALES & ENGINEERING CO. (CLARENCE H. MOEN), 417 Metropolitan Bldg., 430 N. Saginaw St., Flint 3, Mich.; and A. F. OLSON, 130 Maynard Drive, Buffalo 21, N. Y.

G. D. BARCUS and C. H. GOOD have joined the design and engineering section of the Carboloy Department of General Electric Co., Detroit, Mich. Mr. Barcus was formerly with the company's engineering services division in Schenectady, N. Y., while Mr. Good recently completed the Carboloy training program. Also announced was the appointment of FRANK B. NUELLE as manager of the engineering administration section.

MICHIGAN TOOL Co., Detroit, Mich., manufacturer of all types of gear production equipment, is purchasing the MANISTEE IRON WORKS, Manistee Mich. This company produces salt evaporators, pumps, valves, and hydrants. At the present time, the Michigan Tool Co. is operating the Manistee plant under lease.

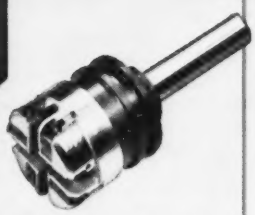
WILLIAM H. HARRIS, JR., was recently elected to the board of directors of the Micromatic Hone Corporation, Detroit, Mich., filling the vacancy created by the resignation of HARVEY C. FRUEHAUF. Mr. Harris, who joined the corporation in 1935 as assistant chief engineer, holds the post of vice-president in charge of engineering.

IPSEN INDUSTRIES, INC., Rockford, Ill., manufacturers of automatic heat-treating equipment, announce the opening of a sales and service division at 10600 Puritan Ave., De-

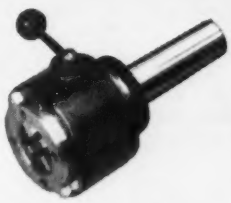
Reduce THREAD COSTS and *Increase* THREAD QUALITY with MURCHEY TOOLS



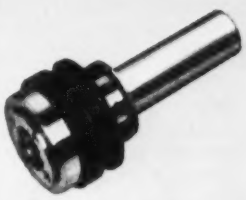
Precision-Pak with die heads and collapsible taps automatically taps holes up to 4" dia., cuts external threads up to 3½" dia.—also bores and reams. Lead accuracy assured by precision lead screw.



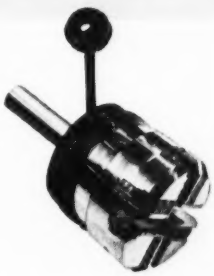
Rotating Die Heads, Type "ORB" with snap action trip and quick change radial type chasers, cut straight threads ⅛" to 5" dia.



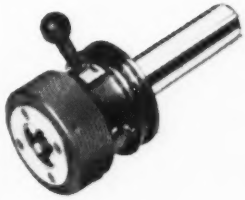
Non-rotating Die Heads, Type "OLB" with pull off snap trip and quick change radial type chasers, cut straight threads ⅛" to 5" dia.



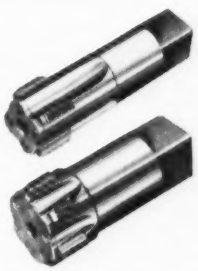
Rotating Die Heads, Type "TRB" with snap action trip and quick change Tangent chasers, cut straight threads ⅛" to 2" dia.



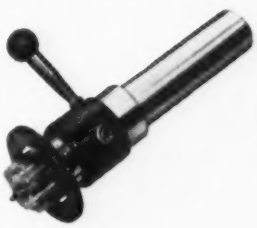
Non-rotating Tangent Die Heads, Type "TLC", with pull-off snap trip and quick change chasers, cut straight threads ¾" to 2" dia.



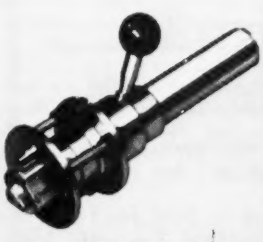
New 4 in 1 Type "ACB" Die Heads, Rotating and Non-Rotating feather action trip, cut straight threads ⅛" to 4" and tapered pipe threads ⅛" to 3½".



Solid Adjustable Taps "EHB" and "RHB" with removable chasers, cut threads 1¼" to 5" dia.—ideal for salvage work.



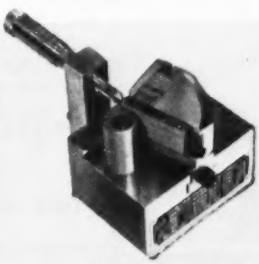
Standard Collapsible Machine Taps, Rotating or Non-Rotating, with easy size adjustment, cut straight threads 1¼" to 7" dia.



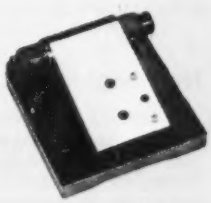
Semi-receding Pipe Taps, Rotating or Non-Rotating, with taper receding action, cut 1" to 6" taper pipe threads. May be arranged for straight threads also.



Type "L" Machine Taps, Rotating or Non-Rotating, with 18 interchangeable nose pieces and 2 bodies, cut a range of straight threads to 6¼" dia.



Tangent Chaser Micrometer Setting Fixture provides longer chaser life and better threads through more accuracy in setting chasers in their holding blocks.



Universal Chaser Grinding Fixture for use on either a surface or cutter grinder assures accuracy in grinding chasers of all types.

For more complete information on Sheffield-Murchey threading tools, get in touch with your local representative or write for Catalog MU-153.

Murchey Division, The Sheffield Corporation
Dayton 1, Ohio, U. S. A.

MASTER CRAFTSMAN SHEFFIELD HEADQUARTERS

SHEFFIELD

6548

troit, Mich. Assigned to the new headquarters are ROBERT W. KROGH, sales engineer, and FABERT STULL, service engineer.

BRIDGEPORT BRASS CO., Bridgeport, Conn., announces the opening of a sales office in the Federal Square Building, Grand Rapids, Mich., with THOMAS H. WILLIAMS in charge. Mr. Williams was formerly in the company's Indianapolis sales office.

GEORGE D. HOOPER has joined the Carboloy Department of General Electric Co., Detroit, Mich., as a development engineer in the magnet materials and process development unit.

COLONIAL BROACH CO., Detroit, Mich., producer of broaches and broaching machines, announces the addition of 6000 square feet of floor space to its plant.

MONARCH MACHINE TOOL CO., Sidney, Ohio, announces that the Detroit, Mich., sales staff has moved to larger quarters at 10600 Puritan Ave. H. A. TOY is district manager.

J. C. OWEN has been named chief engineer, instrument products, of the Grand Rapids, Mich., Division of Lear, Inc.

ELMER J. LELL has been named sales manager by the Wall Colmonoy Corporation, Detroit, Mich.

CARPENTER STEEL CO., Reading, Pa., recently celebrated the opening of a new warehouse at 4152 N. 35th St., Milwaukee, Wis. F. P. MCCAHAN is branch manager in charge of the warehouse and office.

RICE PUMP & MACHINE CO. has announced its removal from Grafton to Belgium, Wis. The company manufactures pumps, die filers, profile grinders, and sprue cutters.

New England

GIEBEL, INC., New York City, has been appointed representative by the HANSON-WHITNEY DIVISION OF WHITNEY CHAIN CO., Hartford, Conn., in the territory comprising Connecticut, New Jersey, and eastern New York State. The representative maintains a branch office at 152 Temple St., New Haven, Conn., under the direction of JAMES A. GRAHAM, vice-president.

KURT ORBAN CO., INC., New York City, announces the appointment of the INTERNATIONAL MACHINERY CO., New Haven, Conn., as distributor of its line of German precision machine tools in Southern New England.

FOLLANSBEE STEEL CORPORATION, Pittsburgh, Pa., producer of strip steel, recently purchased an 8-acre site in Wallingford, Conn., on which a warehouse will be constructed.

WARREN F. BICE has been appointed manager of industrial fastener sales for the Waterville Division, Waterville, Conn., of the Scovill Mfg. Co.

RICHARD N. RUSCH, sales engineer for Acme Welding, division of the United Tool & Die Co., West Hartford, Conn., has been named New England sales manager.

STEPHEN B. METCALFE has been appointed assistant district manager of operations at the Worcester, Mass., district of the American Steel & Wire Division, United States Steel Corporation, Cleveland, Ohio. Mr. Metcalfe was general superintendent of two plants of the Wire Division—at New Haven, Conn., and Trenton, N. J.—at the time of his promotion. He has been with the Division since 1929.

EDWARD VAN DER PYL, director of equipment engineering at the Norton Co., Worcester, Mass., recently retired after a distinguished career with the organization which began in 1909. He has been responsible for forty-five patents, many of them in the field of diamond grinding wheels. Mr. Van der Pyl will continue as a consultant to the company.

C. V. STEVENS, JR., has been appointed representative for southeastern Massachusetts and Rhode Island for Stedfast & Roulston, Inc., Boston, Mass.

JONES & LAMSON MACHINE CO., Springfield, Vt., announces the establishment of a Market Research and Sales Analysis Division. NATHANIEL R. KIDDER has been named division manager. Mr. Kidder comes to the company from the Department of the Army operations research office, where he served as civilian research consultant.

New York and New Jersey

AMERICAN MACHINE & FOUNDRY CO., New York City, announces the consolidation of its New York offices, now in three locations, to a new building at 261 Madison Ave., which address will be known as the AMF building. The move will take place in February. The offices to be transferred are presently located at 511, 485, and 261 Fifth Ave.

ANDERSON W. POLLARD has been appointed sales representative in the Buffalo, N. Y., and Pittsburgh, Pa., areas by the Worcester Pressed Steel Co., Worcester, Mass. He will make his headquarters in the Case Building, 82 St. Paul St., Rochester, N. Y.

GENERAL AMERICAN TRANSPORTATION CORPORATION, Chicago, Ill., recently acquired the PARKER-KALON CORPORATION, New York City, manufacturer of screw fastening devices. The business will continue to operate as the Parker-Kalon Division.

RALSTON B. REID has been named manager of advertising and sales promotion for the Apparatus Sales Division of the General Electric Co., Schenectady, N. Y.

JOHN H. ADAMS has joined the Dollinger Corporation, Rochester, N. Y., manufacturer of industrial filters, assuming the position of assistant chief engineer.

CHARLES D. THOMAS, a special project engineer with General Riveters, Inc., Buffalo, N. Y., has been appointed to the position of chief engineer.

THOMAS D. NAST has become president of All-State Welding Alloys Co., Inc., White Plains, N. Y., succeeding BENT LAUNE, who has resigned.

JOHN L. MACDONALD has been named manager of the newly opened Newark, N. J., factory branch office of the Thor Power Tool Co., Aurora, Ill. Mr. MacDonald was formerly industrial tool service engineer for the company in Boston, Mass.

HAROLD E. COLLINS was recently named vice-president of the Metals Disintegrating Co., Inc., Elizabeth, N. J. Mr. Collins will handle the company's marketing operations in its Pigments and Abrasives Divisions.

FIRTH STERLING, INC., Pittsburgh, Pa., has established a new office at 200 North Ave., Westfield, N. J., combining the Philadelphia and New York offices in a Mideastern district. HOWARD M. DAWSON is manager.

STEEL SHOT CORPORATION is a newly organized concern located at Newark Ave. and Market St., Kenilworth, N. J., devoted to the manufacture of steel shot and grit.

WILLIAM A. ROSS has joined the Circo Equipment Co., Clark (Rahway), N. J., manufacturer of vapor degreasers and solvents, in the capacity of sales manager.

Ohio

FRANK LONG has joined the E. W. Bliss Co., Canton, Ohio, in the capacity of sales engineer at the Cleveland, Ohio, office. Prior to joining the company, Mr. Long was in military service, having been commanding officer of the Cleveland Ordnance District's regional offices in Akron, Cleveland, and Toledo.

(*Continued on page* 259)



Many companies cut their costs with

Revere Electric Welded Steel Tubing

Available from ¼" to 4½" O.D. — Walls from .025" to .187"

A leading maker of appliances was using a heavy tubular member as a wringer post extension. With the collaboration of Revere Steel Tube engineers, the manufacturer developed a simple fabricated part of Revere Electric Welded Steel Tube, supplied ready for assembly. This reduced the thickness of the tube wall by half, cutting costs considerably and making the machine somewhat lighter and thus more attractive to users.

Revere offers you Electric Welded Steel Tube in the shapes shown here, and many others. The tube can be made so it is impossible to find the weld. Our Technical Advisory Service will gladly collaborate with you on applications to your product.

REVERE

COPPER AND BRASS INCORPORATED

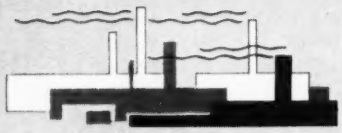
Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

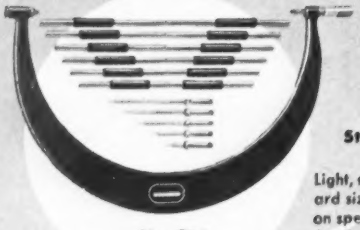
Distributors of Revere Electric Welded Steel Tube are: Austin Hastings Company, Inc., Boston, Mass. • Peter A. Frasse & Co., Inc., New York, N. Y., Philadelphia, Pa., Buffalo, N. Y., Syracuse, N. Y. • C. A. Roberts Co., Chicago, Ill., Detroit, Mich., Indianapolis, Ind., St. Louis, Mo., Tulsa, Okla. • Joseph T. Ryerson & Son, Inc., Cleveland and Cincinnati, Ohio, Pittsburgh, Pa., Los Angeles and San Francisco, Calif. • Peden Iron & Steel Co., Houston, Texas.

SEE "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

All the skill in the world can't put precision into a product without accurate measuring tools. See that your men check their work with Starrett Tools and you will avoid a major source of loss at final inspection.

FOR PRECISION IN PRODUCTION

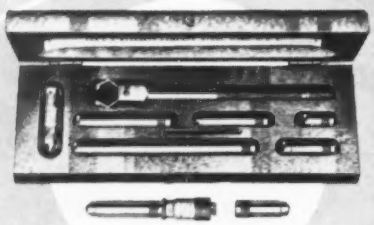




No. 724

Starrett Tubular Micrometer
No. 724

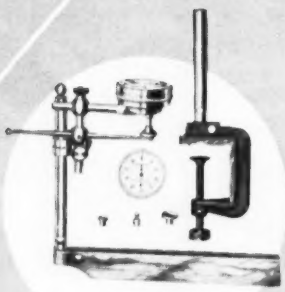
Light, sensitive and easy to handle. Standard sizes from 12" to 60" — up to 168" on special order. Bow and bar types with fixed, sliding or interchangeable anvils. Also with dial indicator heads on special order.



No. 823

Starrett Inside Micrometer
No. 823

With tubular rods, quick-reading micrometer head, hardened and ground contact surfaces, no-glare Satin Chrome Finish. Available in 1½ to 8" or 1½ to 12" capacities. No. 124 with solid rods up to 32" capacity also available.



No. 196-A

Starrett Universal Dial Test Indicator
No. 196-A

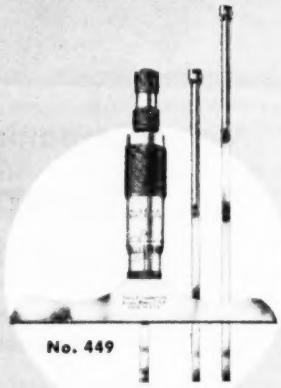
Easy to set up, read and use. Standard attachments provide for universal application on lathe tool posts, surface gage spindles, lathe and planer tools, arbors, etc. Graduated .001", reads 0-100, range .200". Also available to read 0-50-0, 0-20-0 and 0-40.



No. 831

Starrett Small Hole Gages
No. 831

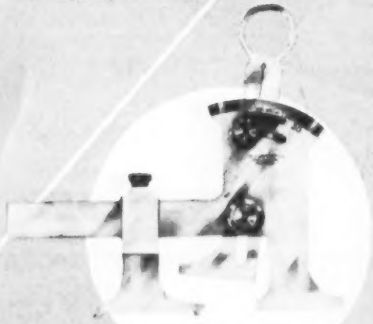
Quick adjusting, sensitive, with flat contacts plus long handles for gaging deep or shallow holes, slots, etc. Four gages cover the range ⅛" to ½".



No. 449

Starrett Micrometer Depth Gages
No. 449

Flat rods can be turned to any angle, won't roll off narrow shoulders. Has 1-inch movement, Satin Chrome Finish, range 0-3 or 0-6 inches, choice of 2½ or 4 inch base.



No. 459

Starrett Cutter Clearance Gage
No. 459

Checks clearance on end, side, spiral, helix and inserted-tooth cutters from ½" diameter up — without removing cutter from arbor. Use it to prolong cutter life, improve production, save grinding time, reduce costs.

STARRETT TOOLS

TRADE MARK **Starrett** REG U S PAT OFF

SINCE 1880
WORLD'S GREATEST TOOLMAKERS



THE L. S. STARRETT COMPANY
Athol, Massachusetts, U. S. A.

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS, BAND SAWS and BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR

Prompt delivery
Dependable service
Quality products

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MACHINERY'S DATA SHEETS 743 and 744

RECOMMENDED PRACTICE FOR SHARPENING CARBIDE-TIPPED MASONRY DRILLS

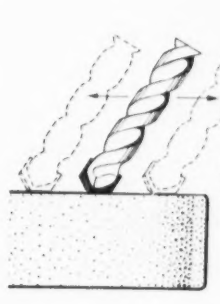
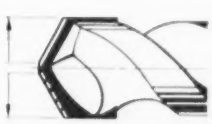
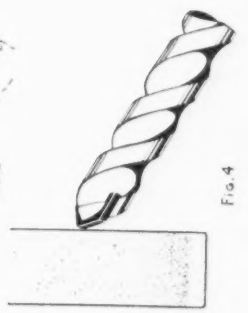


Fig. 1

Fig. 2


Fig. 3


Fig. 4

The following four steps in sharpening carbide-tipped masonry drills, used to drill brick, plaster, and concrete, have been outlined by the Carboloy Department of the General Electric Co. It is recommended that a silicon carbide wheel (C100-18V or C80-18V) be used in resharpening the drills and restoring the original 118-degree included angle. The drills should be sharpened when a flat 1/64 inch in width develops on the cutting edge. The four steps are:

1. Bring the drill against the side of the grinding wheel at a 20-degree angle, as shown in Fig. 1. This angle should be maintained, otherwise the drill will not cut properly.

2. Using moderate pressure, move the drill back and forth across the wheel to avoid overheating. Fig. 2. (If overheating should occur, do not drop the drill into liquids to cool.)

3. Keep the two cutting edges of the drill of equal length while sharpening, Fig. 3. If one edge varies in size, the drill will make over-sized cuts.

4. Repeated resharpening of the drill will reduce the clearance between the carbide tip and the steel shank. When necessary, grind away the steel from behind the carbide tip so the steel is nowhere closer than 1/32 inch to the working surface of the carbide blank, Fig. 4.

The drills can be sharpened on either a pedestal or bench type grinder. Sharpening can be done on the job by using a portable drill mounted on a stand and fitted with a small silicon carbide wheel.

MACHINERY'S Data Sheet No. 743, December, 1953

Compiled by Carboloy Department of General Electric Co.

RECOMMENDED CONDITIONS FOR SEAM-WELDING MONEL SHEET

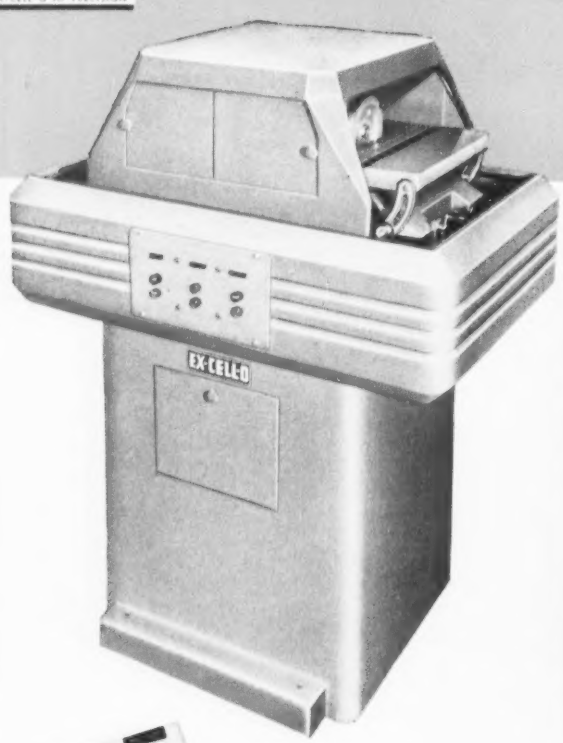
Set-Up Variables			Welding Variables					Fusion Analysis			
Thicknesses of Sheets to be Welded, Inch	Electrode Shape (Dimensions in Inches)	Electrode Force, Pounds	Timing Cycle, Cycles of 60-Cycle Current "On" Time	Timing Cycle, Cycles of 60-Cycle Current "Off" Time	Weld Spacing, Welds per Inch	Wheel Speed, Inches per Minute	Welding Current, Amperes	Width of Fused Zone, Inch	Weld Overlap, Per Cent	Weld Penetration, Per Cent	
0.062	d = 3/8 R = 6	2500	8	12	9	20	19,000	0.17	10	35	Optimum
		2400–2600	6–10	8–15	7–11		16,000–21,000	0.00–0.25	0–15	0–40	Permissible Range
0.031	d = 3/16 R = 6	700	4	12	12	19	10,000	0.15	20	40	Optimum
		600–800	3–6	8–15	10–14		8500–11,000	0.00–0.18	0–25	0–45	Permissible Range
0.021	d = 3/16 R = 6 Electrodes Unburnished	600	3	12	11	22	9500	0.15	10	35	Optimum
		500–700	2–4	8–15	10–12		8000–10,000	0.00–0.18	0–15	0–40	Permissible Range
0.021	d = 3/16 R = ∈ Electrodes Burnished	500	2	6	12	38	8700	0.15	20	40	Optimum
		400–600	1–3	4–8	10–14		7200–8900	0.00–0.18	0–25	0–50	Permissible Range
0.015	d = 5/32 R = 6 Electrodes Burnished	300	1	3	12	75	7600	0.10	15	35	Optimum
		250–350	1/2–1 1/2	2–4	11–13		6800–7800	0.00–0.11	0–20	0–40	Permissible Range
0.010	d = 5/32 R = 3 Electrodes Burnished	200	1	3	12	75	5300	0.09	15	30	Optimum
		150–250	1/2–1 1/2	2–4	11–13		4800–5300	0.00–0.10	0–20	0–35	Permissible Range

MACHINERY'S Data Sheet No. 744, December, 1953

Compiled by the International Nickel Co., Inc., New York City

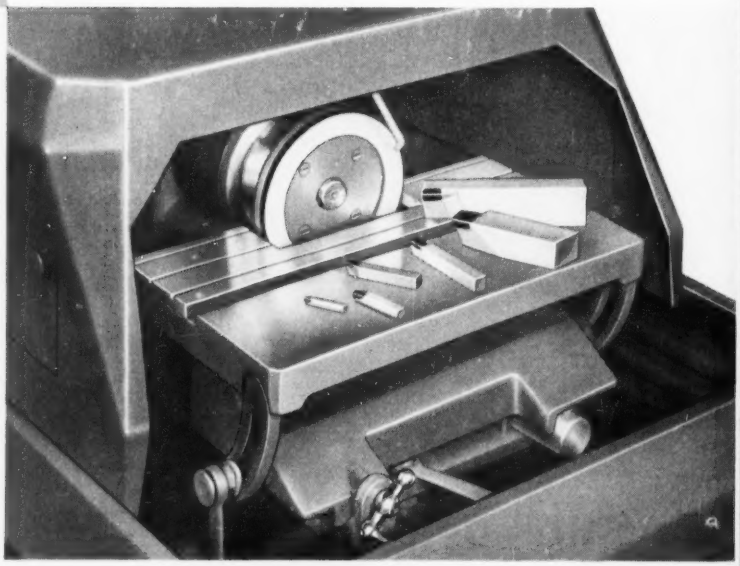
EVERYTHING YOU WANT IN A Tool Grinder

XLO
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A CHOICE OF MODELS FOR EFFICIENT CONDITIONING OF SINGLE-POINT TOOLS

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53-45



(Left to Right) Clare R. Kubik, vice-president for administration of the Motch & Merryweather Machinery Co.; W. J. Chamberlain, director of sales; and E. J. Kossuth, director of the Used Machinery Division

MOTCH & MERRYWEATHER MACHINERY CO., Cleveland, Ohio, recently announced several key appointments, the result of expanded activities. CLARE R. KUBIK has been named vice-president for administration. Mr. Kubik joined the company in 1931 and has served in various sales capacities. W. J. CHAMBERLAIN has been appointed director of sales. Prior to this appointment, Mr. Chamberlain served as sales manager for the Machine Tool Distributing Division. He has been with the company since 1926. J. F. ROMANS, who was plant manager in charge of machine tool building operations, has been made director of engineering and manufacturing. E. J. KOSSUTH, who was sales manager of the Used Machinery Division, has been promoted to the post of director of the Division. Mr. Kossuth joined the company in 1928.

PAUL W. ARNOLD and CHARLES R. SUTHERLAND, engineers with the Reliance Electric & Engineering Co., Cleveland, Ohio, have been appointed to newly created positions. Mr. Arnold, who was executive assistant to the sales vice-president, now is manager of marketing services; while Mr. Sutherland, who was manager of large motor engineering, is assistant chief engineer.

PARKER RUST PROOF CO., Detroit, Mich., has established a south central region with headquarters at 1246 W. 70th St., Cleveland, Ohio. B. L. DITTMORE, who has been with the company for twelve years, has been named regional manager.

ROLL FORMED PRODUCTS CO., Youngstown, Ohio, has recently added 24,000 square feet of floor space to its plant. The new addition houses automatic polishing and degreasing facilities, and new bending equipment for the production of shapes from ferrous and non-ferrous metals.

LESLIE B. BELLAMY has been named general manager of the Sterling Abrasives Division at Tiffin, Ohio, by the Cleveland Quarries Co., Cleveland, Ohio. Since 1946, Mr. Bellamy has been district manager at Detroit for the Division, maker of artificial industrial abrasives.

MASON BRITTON, JR., has been appointed sales manager of the Cincinnati Lathe & Tool Co., Cincinnati, Ohio. Mr. Britton joined the Cincinnati Milling Machine Co. in 1946,



Mason Britton, Jr., new sales manager of the Cincinnati Lathe & Tool Co.

and after a two-year interval when recalled to active duty by the Navy, was assigned to product development and market analysis. He joined the Cincinnati Lathe & Tool Co. in the capacity of sales engineer the beginning of this year.

ALUMINUM COMPANY OF AMERICA, Pittsburgh, Pa., recently appointed a second distributor of Alcoa aluminum products in the Cleveland area: HAMILTON STEEL CO., Cleveland, Ohio, a subsidiary of the Federated Steel Corporation, Pittsburgh, Pa.

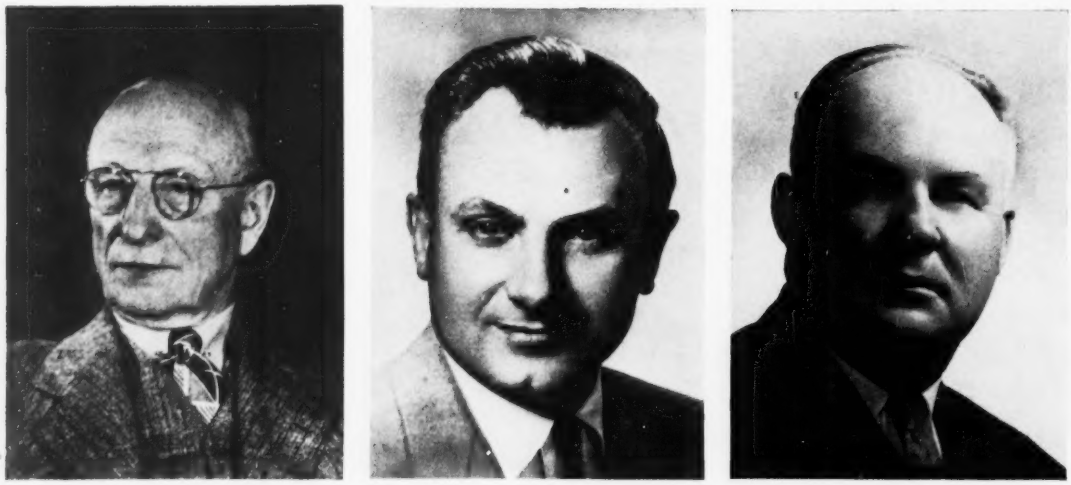
WHITE-ROTH MACHINE CORPORATION, Lorain, Ohio, announces the appointment of the MOTCH & MERRYWEATHER MACHINERY CO., Cleveland, Ohio, as regional distributor for the White-Roth BurrMaster, a new tumbling machine.

RICHARD G. TESSENDORF was recently elected a vice-president of Aluminum Industries, Inc., Cincinnati, Ohio. At the time of his appointment, he was general works manager of all plant operations.

ANKER-HOLTH DIVISION, Port Huron, Mich., of the Wellman Engineering Co., recently appointed the PADDON CO. representative in the Youngstown, Ohio, sales territory, replacing the F. J. Bowers Co.

FIRTH STERLING, INC., announces the removal of its Cleveland office from 142 E. 25th St., N. E., to 2250 Euclid Ave., Cleveland 15, Ohio. STUART A. SMITH is the district manager.

HERR ENGINEERING CO. has changed its name to the HERR EQUIPMENT CORPORATION, and has moved to 1201 Vine St., Warren, Ohio.



(Left to Right) L. Gerald Firth, retiring vice-president and director of research for Firth Sterling, Inc. T. G. Barnes, newly elected vice-president—sales; and J. T. O'Brien, vice-president—operations

HENRY J. GARDNER has joined Airmatic Valve, Inc., Cleveland, Ohio, as chief engineer. One of his first assignments will be to develop a new line of small valves for the machine tool industry.

Pennsylvania

GILBERT T. BOWMAN has been named manager, products department, of the Meter and Valve Division, Rockwell Mfg. Co., Pittsburgh, Pa. He had been manager of gas products and Nordstrom valve products prior to assuming this newly created post. O. W. BARNETT has been made Nordstrom valve products manager, assuming Mr. Bowman's former position. GEORGE A. CUNNINGHAM, who was assistant gas products manager, has been named gas products manager.

LORIN L. FERRALL, director of metallurgy for the Crucible Steel Company of America, Pittsburgh, Pa., has been promoted to the post of assistant vice-president of the company. Mr. Ferrall has been assigned to the operating department. DAVID I. DILWORTH, JR., who was assistant director of metallurgy, has become director of metallurgy. The company's central metallurgical department will now become a division of the operating department.

L. GERALD FIRTH, vice-president and director of research for Firth Sterling, Inc., Pittsburgh, Pa., recently retired after thirty-nine years of service, having joined the company in 1914. He began his career in England with Thos. Firth & Sons. In 1918, Mr. Firth became works manager of the Pittsburgh concern and, from 1933 to 1947, served as president and general manager. A pioneer and authority on specialty steels and sintered carbides, Mr. Firth has made many contributions to the tool and die steel industry through the years. At this time, the company also announced the election of the following executives: T. G. BARNES, vice-president—sales; and J. T. O'BRIEN, vice-president—operations. Mr. Barnes was general manager of sales prior to his promotion, while Mr. O'Brien was works manager, the position he held since 1951.

WESTINGHOUSE ELECTRIC CORPORATION, Pittsburgh, Pa., announces the following executive appointments: in the Switchgear Division, C. P. WEST, assistant to the manager, and A. A. JOHNSON, manager of the Division's engineering department; in the Transportation and Generator Division at East Pittsburgh, A. M. HARRISON, manager of the engineering department, and P. G. LESSMANN, assistant manager for the department.

SAMUEL H. GREENWOOD has been appointed district manager by the F. J. Stokes Machine Co., Philadelphia, Pa., of an enlarged territory with separate headquarters at 5500 Tabor Road, Philadelphia. The territory will include eastern Pennsylvania, upper New York State, lower New Jersey, Delaware, and the Southeast extending to Florida.

MAYNARD B. WYMAN and H. C. COLEMAN were named manager and assistant manager, respectively, of the newly created engineering, and service department in the Apparatus Division of the Westinghouse Electric Corporation, Pittsburgh, Pa. Mr. Wyman has been with the corporation since 1923, while Mr. Coleman joined Westinghouse in 1916.

CHARLES W. SNYDER has been named a district sales manager for DeWalt, Inc., Lancaster, Pa., subsidiary of the American Machine & Foundry Co. His territory will include Delaware, southern New Jersey, and eastern Pennsylvania. Mr. Snyder will have his headquarters in Lancaster.

DR. GEORGE A. ROBERTS, chief metallurgist of the Vanadium-Alloys Steel Co., Latrobe, Pa., has been elected to the post of vice-president in charge of technology. Dr. Roberts will direct the company's research and development program and head the technical staff.

UNITED STATES STEEL CORPORATION, New York City, has announced that operation of bar mill facilities began at the Fairless Works, Morrisville, Pa., in November.

PENNSYLVANIA PEERLESS CORPORATION has opened its new plant in Pottsville, Pa., designed for the manufacture of special production equipment.

YOUNG TESTING MACHINE CO., Bridgeport, Pa., has opened a new plant to be devoted to the manufacture of precision weighing systems.

KENNAMETAL, INC., Latrobe, Pa., has recently opened a new shop building affording 28,800 square feet of additional production area.

CARPENTER STEEL CO., Reading, Pa., announces the election of the following vice-presidents: H. STURGIS POTTER, who was formerly general sales manager, is now vice-president in charge of sales at the main Reading plant; ARLINGTON A. BRITTON, JR., previously general superintendent of the Reading Mill,



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(Left to Right) H. Sturgis Potter, Arlington A. Britton, Jr., and John Moxon—recently appointed vice-presidents of the Carpenter Steel Co.

serves as vice-president in charge of production; and JOHN MOXON, formerly secretary and treasurer of the company, becomes vice-president, treasurer, and secretary.

Texas and Georgia

ANSEL WILTSIE has become shop superintendent of the Oil Tool Division of the Reed Roller Bit Co., Houston, Tex., replacing OSCAR SELKE, who has retired after thirty-five years of service. Mr. Wiltsie was assistant shop superintendent.

EDWIN T. TEAL has been made regional sales manager for the West South Central and Mountain States by the Whitney Chain Co., Hartford, Conn. Mr. Teal will make his headquarters at the company's Dallas, Tex., office.

FOXBORO CO., Foxboro, Mass., manufacturer of industrial measuring instruments, has opened an office at 1117 La Paloma St., Amarillo, Tex. D. T. MCELLIGOTT has been assigned there as industrial engineer.

RICHARD T. BURKE, sales engineer, has been added to the Houston, Tex., staff of Tube Turns, Inc., Louisville, Ky., manufacturer of forged seamless welding fittings and flanges.

WHITMAN & BARNES, Plymouth, Mich., manufacturers of cutting tools, have announced the opening of a warehouse at Atlanta, Ga., located at 1851 Cheshire Bridge Road, N. E.

Washington and California

KLING BROS. ENGINEERING WORKS, Chicago, Ill., makers of steel fabricating machinery, announce the purchase of the POPE MACHINE CO., INC., Seattle, Wash., manufacturer of plate bending rolls. The Pope plant will continue to operate as a subsidiary of Kling with ARTHUR H. HEIST as president and WILLIAM C. POPE and CARL W. KLING as vice-presidents.

EARL R. MUIR, JR., sales engineer, has been assigned to the Seattle, Wash., office, 203 White Bldg., by Tube Turns, Inc., Louisville, Ky.

HARVEY V. EASTLING, assistant general manager, has been promoted to general manager of the Pacific Division with headquarters in San Francisco, Calif., of the Link-Belt Co., Chicago, Ill. He succeeds RALPH M. HOFFMAN, who is retiring after forty years of service. Mr. Eastling joined the company in 1925, and became general sales manager of the Pacific Division in 1940.

GEORGE W. DOWNS has been named vice-president and chief engineer of William Miller Instruments, Inc., manufacturers and designers of scientific instruments, Pasadena, Calif.

SARCO, INC., New York City, manufacturer of steam traps and temperature regulators, recently established a sales office at 35 Elmira St., San Francisco, Calif., with J. S. SPEAR as sales manager.

DAVID SHIPLEY has joined Marvic, Inc., San Mateo, Calif., manufacturer of tool-blocks and tool-holders, as general sales manager.

JOHN HOGG has joined William Miller Instruments, Inc., Pasadena, Calif., as sales engineer.

BARKSDALE VALVES has moved to a new plant at Fruitland and Alcoa, Los Angeles, Calif.

Coming Events

JANUARY 25-28, 1954—PLANT MAINTENANCE AND ENGINEERING SHOW to be held at the International Amphitheater, Chicago, Ill. For further information write to Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

APRIL 26-30, 1954—Tenth Biennial Industrial Exposition of the AMERICAN SOCIETY OF TOOL ENGINEERS to be held at Convention Center in Philadelphia, Pa. Executive secretary, Harry E. Conrad, 10700 Puritan Ave., Detroit 21, Mich.

MAY 4-7, 1954—National spring technical meeting of the AMERICAN WELDING SOCIETY to be held at the Hotel Statler, Buffalo, N. Y. in conjunction with the Second Welding and Allied Industry Exposition at the Buffalo Memorial Auditorium. National secretary, J. G. Magrath, 33 W. 39th St., New York 18, N. Y.

JUNE 7-10, 1954—Sixth National Plastics Exposition sponsored by the SOCIETY OF THE PLASTICS INDUSTRY, INC., at the Public Auditorium in Cleveland, Ohio. Chairman, P. H. Grunnagle, Society of the Plastics Industry, Inc., 67 W. 44th St., New York 18, N. Y.

* * *

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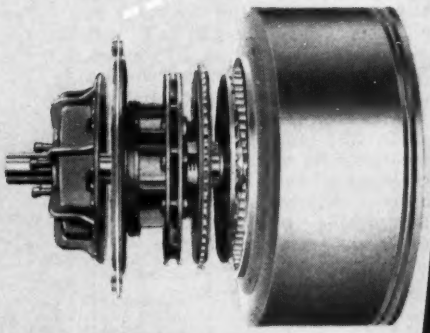
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Obituaries

George Rowbottom

George Rowbottom, founder and president of the Rowbottom Machine Co., Waterbury, Conn., died at his home on September 21 at the age of eighty-six years. Mr. Rowbottom was born in 1867 in England, and began his working career in a Manchester factory in 1877 by tapping



George Rowbottom

nuts and bolts on a hand machine. When he was nineteen years old, he came to Massachusetts and went to work for the Whitin Machine Co., in Whitinsville, Mass. He later became associated with the Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., where he was in charge of the drafting room. In 1902, he incorporated the Rowbottom Machine Co. in a wooden building next to the present location on Sheffield St. in Waterville, Conn. He invented various special machines and developed the first practical cam milling machine, from which grew the present specialty of the company. Mr. Rowbottom was still active president of the company at the time of his death. He was a member of the National Machine Tool Builders' Association, and the American Society of Mechanical Engineers. He is survived by a son, Archer Rowbottom.

W. EARLE SHUMWAY, manager of sales engineering at the Norton Co., Worcester, Mass., died on October 25. Mr. Shumway, who was a resident of Shrewsbury, Mass., was associated with Norton since 1917, when he started in the research laboratories, and later became a sales engineer. In 1928, he was appointed district manager at Hartford, Conn., and in 1932, held a similar position in Chicago, Ill. Subsequently, he became sales engineer of the Western Region, and in 1950, was appointed to the post he held at the time of his death. Mr. Shumway is survived by his wife, a son, and a daughter.

JAMES H. KING, vice-president and director of the Babcock & Wilcox Co., New York City, died on November 14 at the age of sixty-one years. Mr. King joined the company in 1914 as a student engineer and after various assignments was appointed manager of the marine department in 1931. He was elected a vice-president in 1945 and head of the Boiler Division last year. Mr. King was a member of a number of technical societies, including the Society of Naval Architects and Marine Engineers of which he served as president in 1951 and 1952.

LEWIS D. SPENCE, a retired executive of the Brown & Sharpe Mfg. Co., Providence, R. I., died suddenly on November 9 at the age of seventy-four years. Mr. Spence joined Brown & Sharpe as an apprentice in 1898. Several years later, he was placed in charge of the automatic screw machine drafting department. Mr. Spence became known as an authority on the construction and use of automatic screw machines. He relinquished active work in 1943, but continued in an advisory capacity for six years.

ANDREW H. KEAN, sales representative for the Edward A. Lynch Machinery Co., Wynnewood, Pa., died on November 16 following a brief illness. He was sixty-six years old. Prior to joining this company in 1944, he had been secretary-treasurer of the Bridgeport Safety Emery Wheel Co.

Awards for Welded Machine Designs

Dimitri Soussloff, associate director of research for the Universal Winding Co., Providence, R.I., manufacturer of textile machinery, received first award in the recent national award program for welded machine designs sponsored by the James F. Lincoln Arc Welding Foundation of Cleveland, Ohio. Mr. Soussloff received the award for his description of a yarn twisting machine, parts of which are redesigned for welded construction. It is estimated that the new design will save the company a total of $100,000 a year, and in addition to being less expensive, the machine has greater adaptability.

The award was one of seventy-seven made by the Lincoln Foundation to engineers and designers in all parts of the country in its $30,000 Mechanical Design Award Program. Awards were made for descriptions of the design and fabrication of welded steel machines and components. The program was sponsored, according to Dr. E. E. Dreese, chairman of the Foundation, to encourage industrial progress through modernizing machine design for arc-welded steel fabrication.

Color Movie of Latest Techniques in Welding Aluminum

A demonstration of the latest techniques in the welding of aluminum pressure vessels is a feature of the new color welding film available from the Aluminum Company of America. The twenty-eight minute, 16-millimeter film "Welding Advances with Aluminum" offers a comprehensive description of welding aluminum, using both the tungsten-arc and consumable electrode methods.

Also described in the film are the services of Alcoa's research and process development facilities, which are offered to customers for the solution of their welding problems. The fil can be borrowed for group showings. Requests for prints should be made on a business letterhead to Motion Picture Section, 818 Alcoa Building, Pittsburgh 19, Pa.

Motion Picture Shows New Developments in Steel Production

A new 16-millimeter color motion picture, "Steel Frontiers," has been produced by Republic Steel Corporation. The theme is the changing technology of the steel industry and the part which Republic is playing in it. The motion picture begins with the description of recent activity within the steel industry in establishing new sources of iron ore, and explores developments in the production of steel in recent years. Such new products as powdered iron, titanium sheets, and plastic pipe are described.

The film has a running time of twenty-eight minutes and is available to schools, colleges, and adult organizations free of charge through the Public Relations Department, Republic Steel Corporation, Republic Building, Cleveland 1, Ohio.

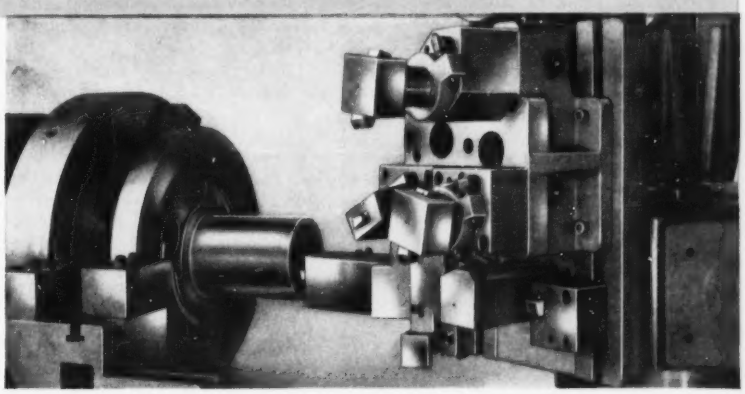
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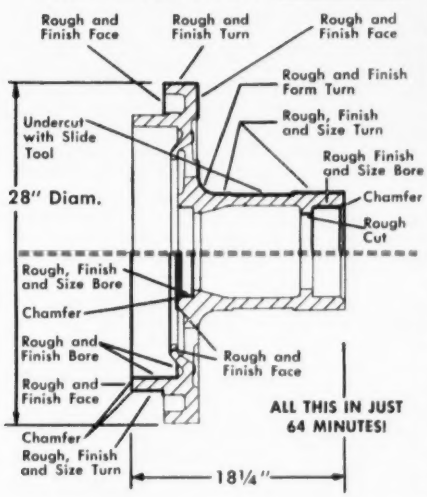
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New Books and Publications

SCREW THREAD PRODUCTION. Vols. I and II. By J. S. Murphy. Vol. I, 154 pages, Vol. II, 176 pages; 5 1/8 by 8 1/2 inches; a total of 286 illustrations. Published by the Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. Sold in the United States by THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y. Price, $3 per volume.

This treatise presents the various methods of producing screw threads in a manner to help the engineer select the best one for a specific job. All modern mass-production methods are described in detail. The equipment and tooling required for each method are included, together with the method of operating the tools. Tool design is also included, and calculations are given, where necessary, to obtain the proper thread form.

Volume I deals with screw cutting, self-opening die-heads, thread tapping, and thread inspection and measurement; Volume II, with thread closing, thread rolling, thread milling, and thread grinding.

METALLURGICAL DICTIONARY. By J. G. Henderson, assisted by J. M. Bates. 396 pages, 6 1/4 by 9 1/4 inches. Published by the Reinhold Publishing Corporation, 330 W. 42nd St., New York 36, N. Y. Price, $8.50.

This dictionary is a convenient source of instant information for the metal industries. Its sole purpose is to provide a comprehensive, up-to-date working tool for all those who manufacture or use metals and metal products. Original definitions are included of a sizable number of terms —such as *flame plating* and *shell molding*—which only recently have appeared in the press. Cross-references have been carefully made. The dictionary includes in its scope definitions of terms in both production and physical metallurgy, and those terms in related fields considered necessary to bring to the user full coverage of available information.

METALS ENGINEERING—DESIGN. Edited by Oscar J. Horger and sponsored by the Metals Engineering Handbook Board of the American Society of Mechanical Engineers. 405 pages, 7 1/2 by 10 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 36, N. Y. Price, $10.

This ASME Handbook is the first of a series and deals primarily with the design function in metals engineering. Three other volumes are in preparation. The material for the present volume has been contributed by recognized authorities writing on such subjects as fatigue characteristics, wear consideration, impact, corrosion, non-destructive testing, elasticity, theories of failure, and many more. There are six parts: Part I deals with the over-all problem of selection of materials in general terms; Part II, consisting of twenty-seven chapters, covers such specific items as high-temperature considerations, plasticity, residual stresses, vibration, fatigue, surface finish, shot-peening, cold-working, nitriding, flame strengthening, joints, and wear; Part III approaches the problems of corrosion and mechanical factors which influence corrosion; Part IV reviews present knowledge of testing; Part V brings to the designer's attention the requirements for mass production and surface finish; and Part VI handles basic information on design theory and practice, elasticity and failure, stresses, strain gages, coatings, and photoelasticity. Also, two chapters are included in Part VI on the special requirements of aluminum and magnesium.

HEAT TREATMENT EQUIPMENT and HEAT TREATMENT PRACTICE. By S. Collard Churchill. (Nos. 26A and 26B, respectively, in the Yellow Back Series). 54 pages (26A) and 60 pages (26B), 5 1/8 by 8 1/2 inches. Published by the Machinery Publishing Co., Ltd., National House, West St., Brighton 1, England. Sold in the United States by THE INDUSTRIAL PRESS, 148 Lafayette St., New York 13, N. Y. Price, 75 cents each.

These texts supplement the author's earlier Yellow Back, *Heat Treatment Fundamentals. Heat Treatment Equipment* contains information on furnaces, heating methods, pyrometers, and protective atmospheres. *Heat Treatment Practice* is concerned with both carbon and alloy steels. Contained in this volume are chapters on steel classification; annealing, normalizing, hardening, and tempering processes; treatment of steel; and surface hardening.

STATEMENT REQUIRED BY THE ACT OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (TITLE 39, UNITED STATES CODE, SECTION 233) SHOWING THE OWNERSHIP AND MANAGEMENT,

of MACHINERY, published monthly at New York, N. Y., for October 1, 1953.

1. The names and addresses of the publisher, editors, managing editor, and business managers are: Publisher, The Industrial Press, 148 Lafayette St., New York 13, N. Y.; Editor, Charles O. Herb; Consulting Editor, Franklin D. Jones; Business Managers, Robert B. Luchars, Edgar A. Becker, and Harold L. Gray. The address of all the foregoing is 148 Lafayette St., New York 13, N. Y.

2. The owners of 1 per cent or more of the total amount of stock are: The Industrial Press, Robert B. Luchars, Edgar A. Becker, Franklin D. Jones, Walter E. Robinson, Charles O. Herb, Harold L. Gray, Clifford Strock, and Suno E. Larson, all of 148 Lafayette St., New York 13, N. Y.; Helena E. Oberg, 65 Eighty-second St., Brooklyn 9, N. Y.; First National Bank of Montclair and Robert B. Luchars, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank of Montclair and Leigh Roy Urban, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank of Montclair and Kenneth D. Ketchum, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; Lee W. Urban, Guardian for Susan Yarnall Urban, 27 Clinton St., Oneonta, N. Y.; Lee W. Urban, Executrix of Will of Robert L. Urban, 27 Clinton St., Oneonta, N. Y.; and John T. Urban, 224 Sullivan St., New York 12, N. Y.

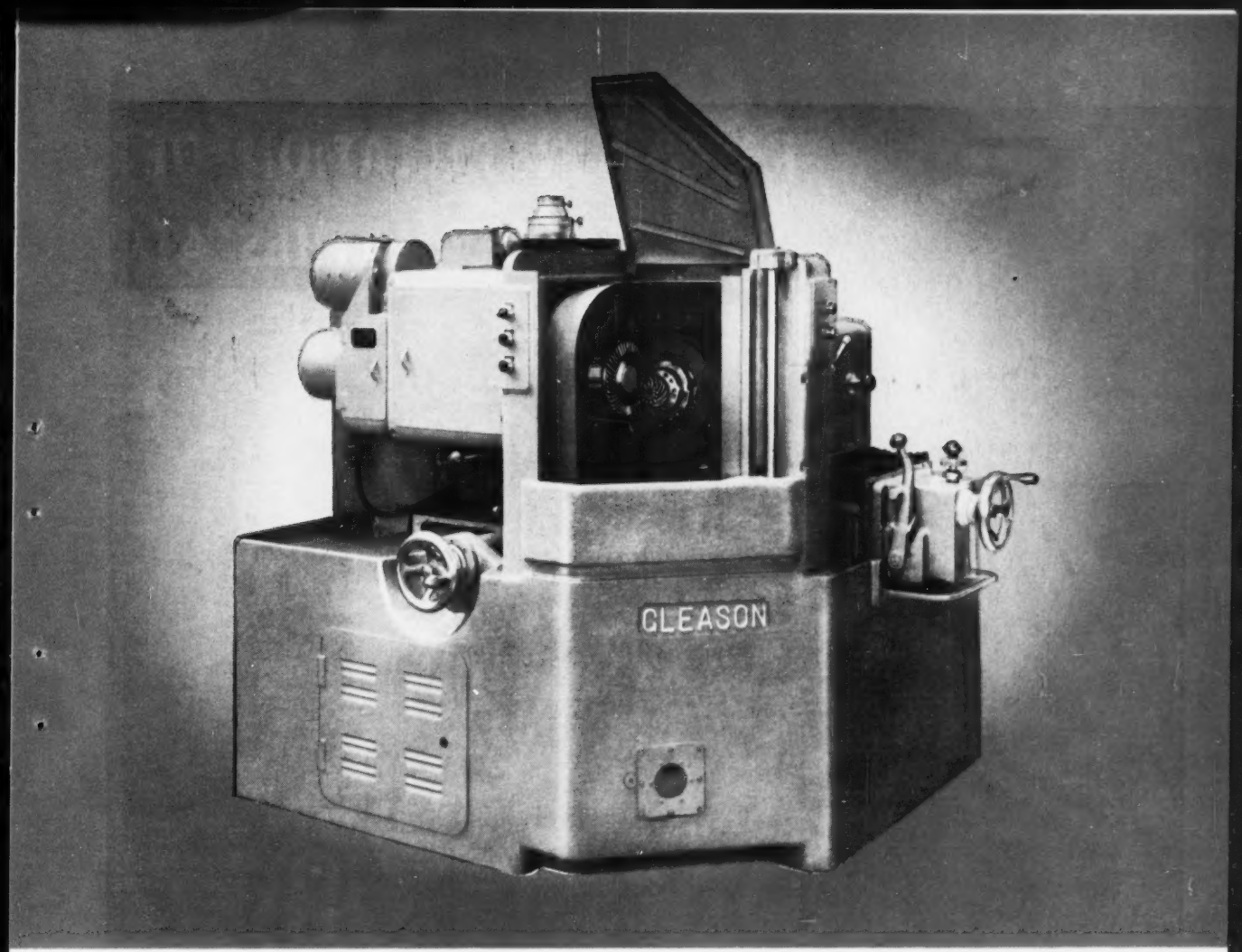
3. The known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: Charlotte B. Baldwin, 420 Clinton Ave., Brooklyn, N. Y.; Robert B. Luchars, Franklin D. Jones, and Louis Pelletier, all of 148 Lafayette St., New York 13, N. Y.; Elizabeth Y. Urban, 38 Lakeview Road, Asheville, N. C.; Helen L. Ketchum, 231 King St., Cohasset, Mass.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt.; and Henry V. Oberg, 6825 Almansa St., Coral Gables, Fla.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

EDGAR A. BECKER, Business Manager

Sworn to and subscribed before me this 22nd day of September, 1953 (SEAL)

ALEXANDER LOYKA
Notary Public, State of New York
No. 41-7611350
Qualified in Queens County
Cert. filed with Queens, New York and Kings Co. Clerks
Term Expires March 30, 1954



SPIRAL BEVEL AND HYPOID GEARS

Lapped faster, better than ever before

The new **No. 19 Hypoid Lapper** is simpler to set up, has greater productivity, and assures improved quality of lapped gears up to 17" diameter. Entirely new machine features include dial-operated controls, elimination of cam systems, and automatic positioning throughout entire lapping cycle.

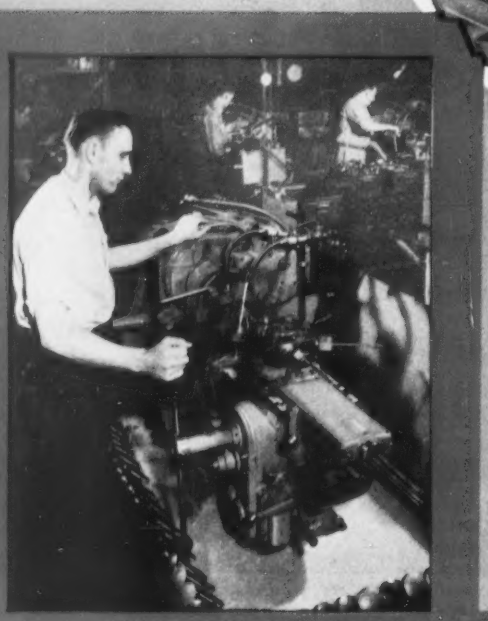
The No. 19 Hypoid Lapper is ideal for volume production or small quantities.

GLEASON WORKS

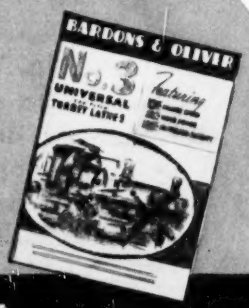
Rochester 3, New York

GLEASON

RECENT INSTALLATION OF TURRET LATHES AT







Photographs Courtesy of Thompson Products, Inc.

Send for New No. 3 Catalog . . .

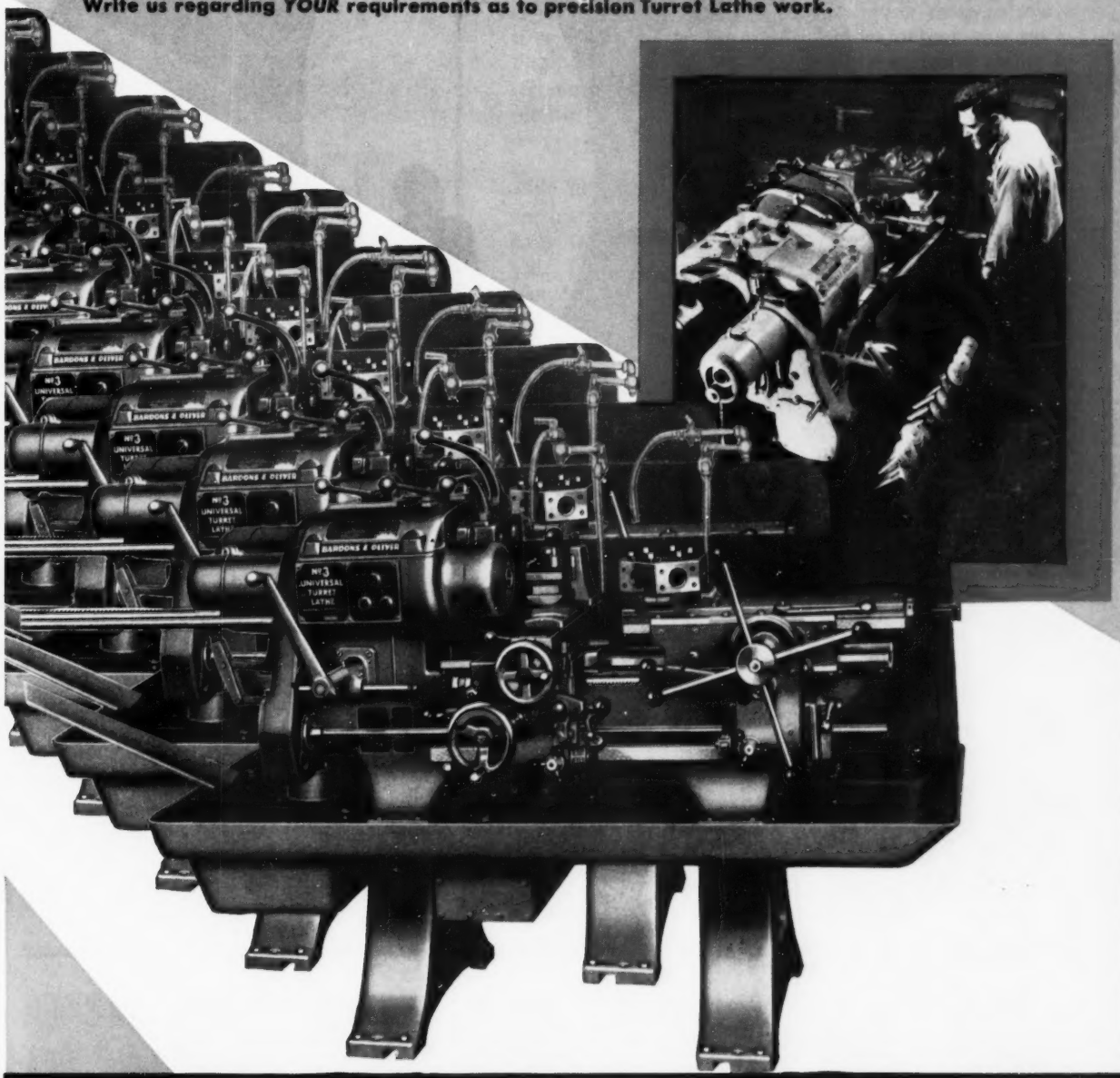
MANUFACTURERS OF A COMPLETE LINE OF
TURRET LATHES AND CUTTING OFF LATHES

22 BARDONS & OLIVER NO. 3
Thompson Products, Inc.

This installation started with only four Turret Lathes and has grown to the present twenty-two.

The machine operators at Thompson Products, Inc. report that each lathe's performance is most satisfactory for making precision aircraft parts.

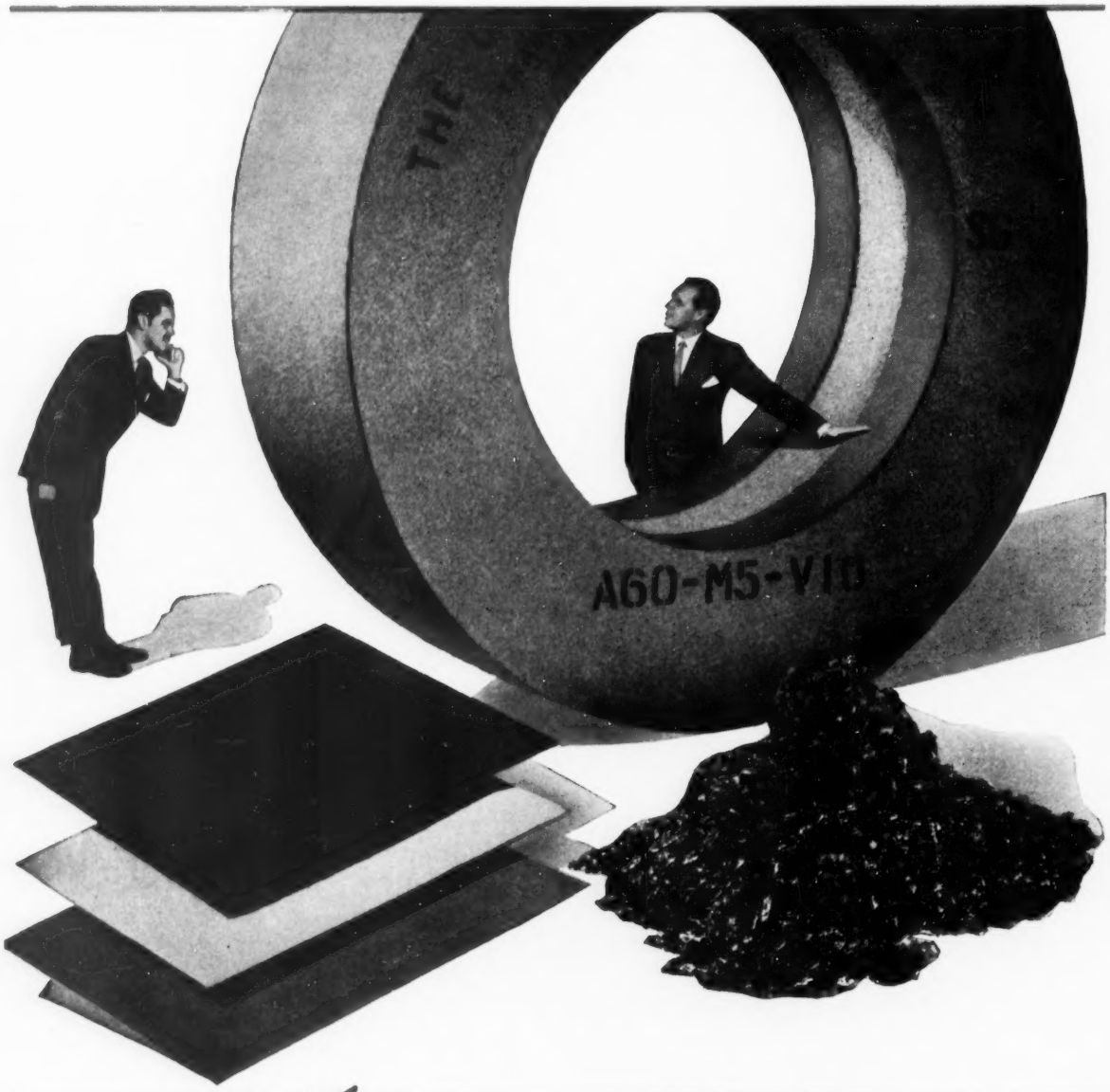
Write us regarding *YOUR* requirements as to precision Turret Lathe work.



BARDONS & OLIVER, INC.

1135 WEST 9TH STREET • CLEVELAND 13, OHIO

What's BEST FOR





CARBO

TRADE

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YOU is BEST for us!

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take surfacing, for instance. There are at least 11 different methods of grinding plane or flat surfaces with abrasives. Is your present method the best—the most economical? How can you be sure? Ask CARBORUNDUM . . . for CARBORUNDUM alone has a complete branded line of grinding wheels *and* coated abrasives *and* tumbling and polishing grains. Only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or perhaps you manufacture table glassware. You can engrave the decorations with a grinding wheel—or you can etch them with high-velocity abrasive grain. You can finish the edges with abrasive belts, or with a grinding wheel. Whatever your method, CARBORUNDUM alone can supply *all* the abrasives you need with *one-source control* of quality . . . quality that's constant, identical, dependable—thus economical.

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Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery . . . and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

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. . . the ONLY source for EVERY abrasive product you need

NEW CARBOLOY

CEMENTED CARBIDE

Increases production up to 30% on heavy-duty steel-cutting jobs

New Grade 370 Carboloy cemented carbide cuts more cubic inches of steel per minute – with longer tool life – than any existing carbide. The first of the new Series 300 cemented carbides, Grade 370 was specially developed for taking heavier cuts in steel at higher speeds than ever before practical.

BUILT-IN TIP RIGIDITY

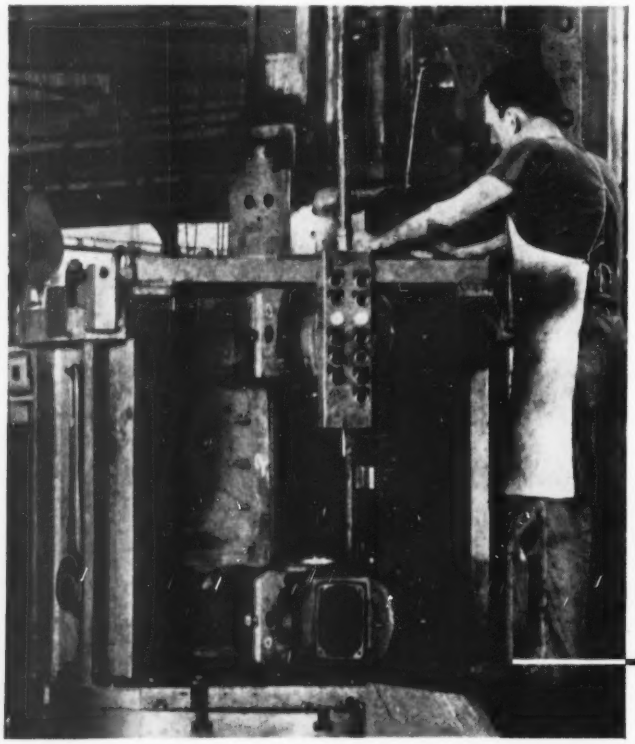
Heavy-duty, high-speed machining builds up great pressures and high temperatures which cause other tools to fail because their cutting edges deform. Grade 370 is made from start to finish by a new, carefully controlled manufacturing process which gives it a built-in structural rigidity to resist this deformation – even at temperatures of around 1800° F.

PROVED PERFORMANCE

Grade 370 has already been proved, both in Carboloy laboratories, and on tough on-the-job customer applications such as rolls, gun barrels, locomotive wheels and other heavy-duty operations. It successfully withstands higher temperatures and pressures of heavy cuts at higher speeds, and lasts longer – longer than any existing carbide. *Production goes up as much as 30%.*

AVAILABLE NOW

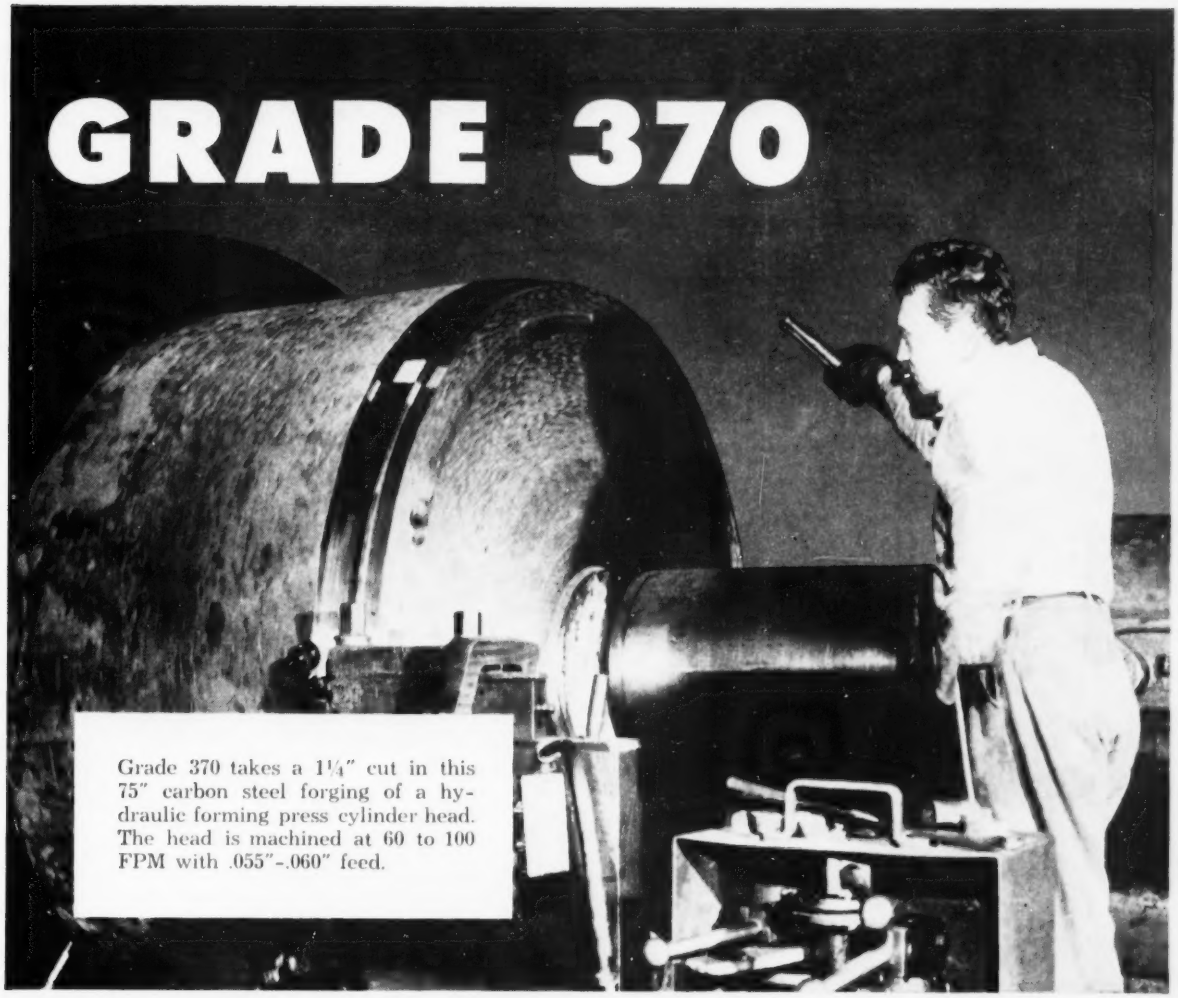
Grade 370 is available immediately in a number of sizes and shapes. Send coupon today for additional information and for free technical literature. The Carboloy Engineering Appraisal Service will work with you on specific applications.



Close-up of cylinder head forging. Grade 370 cuts large chips and withstands the tremendous pressure and temperature without deforming. With Grade 370, both machine downtime and tool cost per cubic inch of steel removed were substantially reduced.

Vertical mill taking ¼" to ¾" cut in an alloy steel casting for a traction motor frame. Grade 370 machined 70 FPM with .060" feed . . . and resulted in a reduction of tool costs of approximately 10 to 1 over other carbides.

GRADE 370



Grade 370 takes a 1¼" cut in this 75" carbon steel forging of a hydraulic forming press cylinder head. The head is machined at 60 to 100 FPM with .055"-.060" feed.



CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

"Carboloy" is the trademark for the products of the Carboloy Department of General Electric Company

CARBOLOY
Department of General Electric Company
11147 E. 8 Mile Street, Detroit 32, Michigan

Gentlemen: Rush me, at no cost or obligation, all facts now available on your new Grade 370 Carboloy cemented carbide.

Name _____

Company _____

Position _____

Address _____

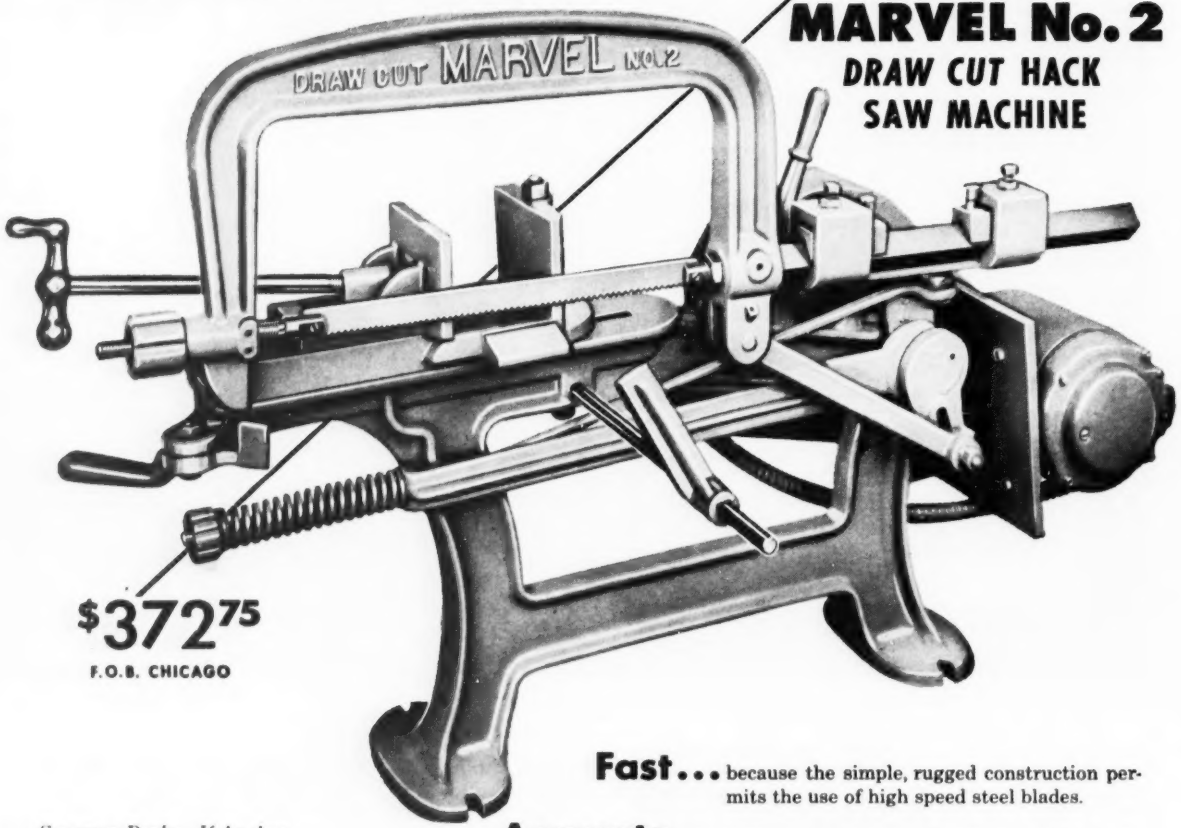
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FAST—ACCURATE—ECONOMICAL—DRY CUTTING

Capacity up to 8" round

Improved MARVEL No. 2 DRAW CUT HACK SAW MACHINE



$372.75
F.O.B. CHICAGO

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Economical... because of its automatic relief on the return stroke, the blade will last and last and last.

Dry Cutting... because modern high speed steel blades will operate efficiently at 60 strokes per minute without a coolant.

MARVEL *Metal Cutting* SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. · 5700 Bloomingdale Ave. · CHICAGO 39, ILL.

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Photograph by Morton Berger

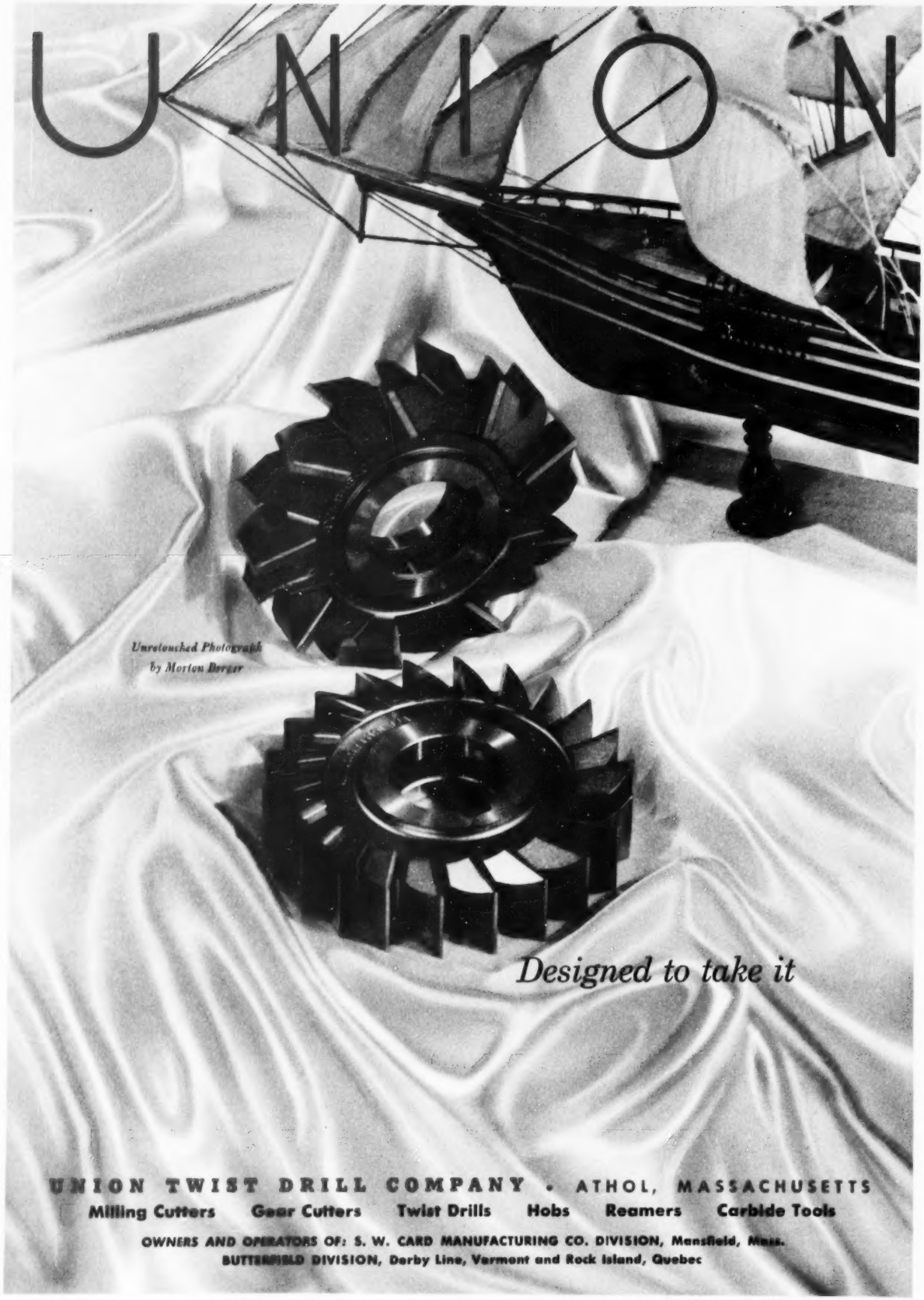
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Milling Cutters Gear Cutters Twist Drills Hobs Reamers Carbide Tools

OWNERS AND OPERATORS OF: S. W. CARD MANUFACTURING CO. DIVISION, Mansfield, Mass.
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BUTTERFIELD

Union Twist Drill Company ***Butterfield Division*** *Derby Line, Vermont, U. S. A.*

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Meters tell the tale but SPECIAL ELECTRICAL ALLOYS do the work

"Steelmaker to the Electrical Industry" is a title we have earned the hard way . . . by the sweat of research and pioneering development. In this modern world of gauges and instruments, of automation, electronics and atomics, the heart of the design is so often some silicon steel, high-permeability alloy, or other special electrical material that we produce. ● When *you* need a steel to do what ordinary steels cannot do—whether electrically or in resisting corrosion, heat, wear or great stress, call on us. *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

W&D 4558-B

PIONEER in Specialloy Steels

Allegheny Ludlum

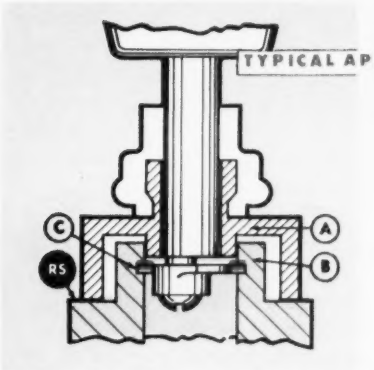
AL TIME-TESTED STAINLESS STEEL

Warehouse stocks of Allegheny Stainless carried by all Ryerson plants

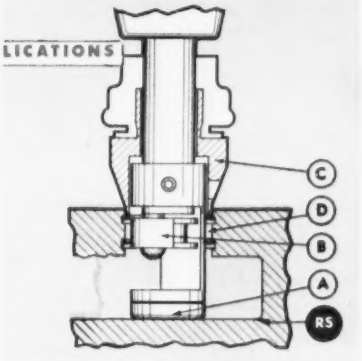
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Waldes Truarc Grooving Tool Out-Performs Conventional Recessing Tools

SAVES TIME! CUTS COSTS! NEEDS NO SKILLED LABOR!

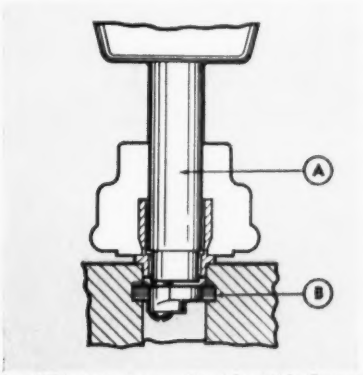


Clearing Obstructions or Protrusions – Waldes Truarc Grooving Tool with *special bushing* with high shoulder A in order to clear obstruction B on reference surface RS so groove can be properly located in bore.

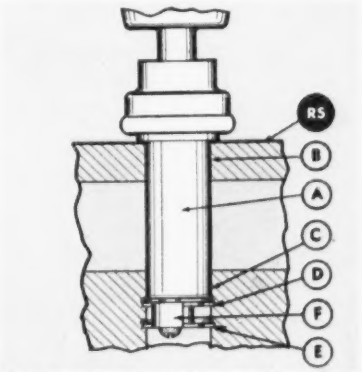


Locating Grooves from Bottom of Hole or Blind Hole—Use of *bottom adaptor* A and double cutter B. Bushing C pilots tool into bore D while bottom adaptor acts as stop to locate grooves from reference surfaces RS below bore.





Small Diameter Bore — Need for Wide Groove – Great versatility of tools allows A-2 Tool to accept *stepped down spindle* and *cutter-shaft* assembly A. Provides cutting capacity in a bore normally within the range of smaller A-1 Tool. Illustrated, larger tool capacity necessary to cut groove diameter B exceeding normal capacity of standard A-1 Tool.



Extending Reach of Tool – Waldes Truarc Grooving Tool assembled with *extended bushing* A increases normal range of tool in order to reach proper groove location in bore. Bushing also registers on reference surface RS of workpiece while piloting tool at two points B and C inside bore. Two grooves D and E are cut simultaneously with double cutter F.

AMAZINGLY VERSATILE! The Waldes Truarc Grooving Tool adapts quickly and simply to your toughest recessing requirements. With it, even *unskilled labor* can perform and maintain high precision, mass production operations.

WIDE CUTTING RANGE! The Waldes Truarc Grooving Tool comes in five models: A-1, A-2, A-3, B and C. This wide variety of models enables you to cut accurate grooves in housings with diameters from .250 to 5.000 inches. Special features, modifications and adaptations allow each model to operate efficiently under many varying conditions.

SEND YOUR PROBLEM TO WALDES! Whatever your internal grooving problem, send us your blueprints and let Waldes Truarc engineers give you a complete analysis, price quotation and delivery information on the most economical tool set-up for your particular job.



WRITE NOW FOR 20 PAGE TECHNICAL MANUAL CONTAINING FULL ENGINEERING DATA



WALDES

TRUARC

Reg. U. S. Pat. Off.

GROOVING TOOL

MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS.

WALDES KOHINOOR, INC., 47-16 Austel Pl., L.I.C.1, N.Y. Waldes Truarc Grooving Tool mfd. under U.S. Pat. 2,411,426

M 125

Waldes Kohinoor, Inc., 47-16 Austel Place
Long Island City 1, New York

Please send me your new 20-page technical manual on the Waldes Truarc Grooving Tool.

Name_____

Title_____

Company_____

Business Address_____

City_____ Zone___ State_____

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WHICH sleeve bearing would you use?



THERE ARE many things to consider when selecting a Sleeve Bearing. Johnson engineers appraise service conditions carefully: load, shock, speed, temperature, lubrication, corrosive conditions and other service considerations. Based on these studies, they will recommend the Sleeve Bearing to suit the application. Since Johnson Bronze produces bearings from cast bronze, cast aluminum alloy, sheet bronze, bronze on steel, babbitt on steel, babbitt on bronze, powdered metal and graphited bronze, a wide variety of Sleeve Bearings is available, and can be recommended without prejudice to any one type. If you are in doubt about the bearing to specify, ask Johnson Engineers. No obligation. Write today.

JOHNSON BRONZE COMPANY
520 South Mill St., New Castle, Pa.

JOHNSON B BEARINGS
Sleeve-Type

SLEEVE BEARING HEADQUARTERS SINCE 1901

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"STANDARD for tough jobs since 1881"



Red Shield says:

Call your Industrial Supply Distributor for Shield Brand Slitting Saws.
Specialized factory service available everywhere.

STANDARD TOOL CO.

3950 CHESTER AVENUE CLEVELAND 14, OHIO

FACTORY BRANCHES IN: NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*



9-Stage progressive dies are used to blank, form, pierce and trim. Feeding and scrap cutting (scrap delivered to tub at side of press) is fully automatic. Piece parts are blown by air up rear delivery chute and onto conveyor for delivery.

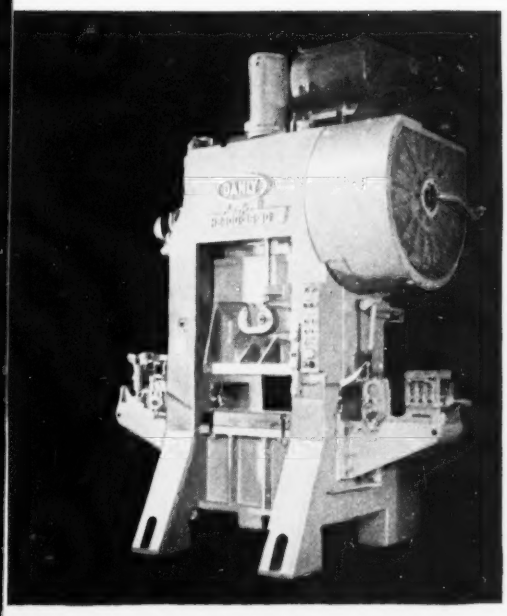
DANLY®

MECHANICAL PRESSES...50 TO 3000 TONS
HYDRAULIC METALWORKING EQUIPMENT

How can you get

high operating efficiency

on high production jobs?



Longer die life . . . continuous high-speed operation of the Danly Autofeed Press makes the die investment pay off in production efficiency... precision press features assure added alignment accuracy and greatly lengthened die life.



A Leading Automotive Parts Manufacturer DID IT on their

DANLY PRESS

Selecting the right press for an intricate die set-up was a difficult problem facing a leading producer of automotive parts. Needed was a *high production* press built for rigidity and precision to extend the life of costly 9-stage progressive dies and improve piece part quality.

What press was specified? A Danly 100-ton Autofeed Press *more than met every requirement* with a remarkably high record of *operating efficiency!* Running full automatic almost continuously through 2 shifts daily, this Danly stamps automobile thermostat valve seats at a rate of 125 strokes per minute. Since installation no major maintenance has been required ... cutting "down-time" losses, permitting steady, uninterrupted production.

Danly Presses have solved this problem for leading stamping shops across the country . . . and can do the same for *you*. Write for free Danly Autofeed Press Booklet and get the details.

DANLY MACHINE SPECIALTIES, INC.

2100 South Laramie Avenue, Chicago 50, Illinois

PROVED AGAIN... *It costs less to run a DANLY PRESS!*



Single Action Straight Side



Autofeed



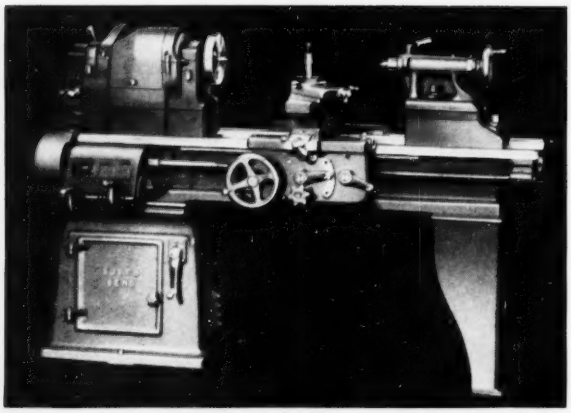
Underdrive Single, Double, Triple Action



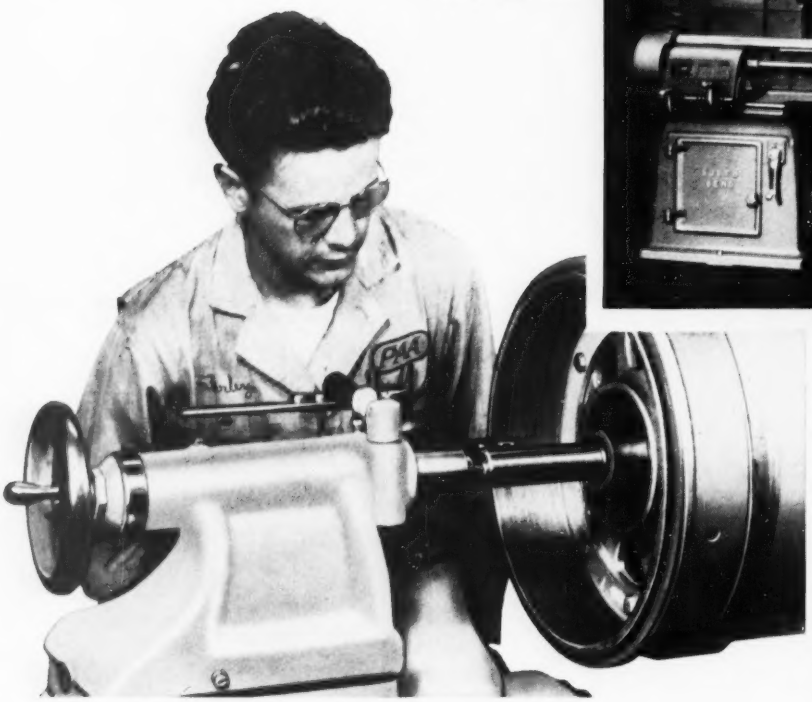
Gap Frame



Double Action Straight Side



16-24" x 6' Quick Change Gear Lathe



SOUTH BEND 16-24" LATHE

CAPACITY for Big Jobs! ACCURACY for Any Job!

Here's a lathe with a versatility that makes equipment dollars go further. Its 24" swing provides the capacity for handling a variety of large diameter, medium-weight jobs whose size would otherwise require large, heavy lathes. This extra capacity is achieved without any sacrifice of efficiency in the machining of smaller work.

Having an unusually wide range of spindle speeds, all sizes of work can be machined at effective cutting speeds. The improved South Bend two lever gear box permits instantaneous selection of power feeds for any turning, facing, or thread cutting operation. A complete line of chucks, tools and attachments simplifies tooling the lathe.

SPECIFICATIONS: Swing over bed and saddle wings—24⅜". **Collet Capacity**—1". **Spindle Speeds,** sixteen—11 to 710 r.p.m. **Longitudinal Feeds**—48 R.H. or L.H., .0015" to .0841". **Cross Feeds**—48 in or out, .0006" to .0312". **Thread Cutting**—48 Threads R.H. or L.H., 4 to 224 per inch.



Yes—you can get most any South Bend product immediately from our distributor's stocks in principal cities. Items not stocked, shipped promptly from factory.

Three ways to order:

1. See or telephone nearest distributor.
2. Order by mail from your distributor.
3. If no distributor is nearby, order direct from factory.

South Bend machine tools with accessories may be purchased on convenient terms up to 12 months.

PLEASE SEND INFORMATION CHECKED:



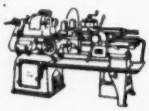
☐ 9" and 10" BENCH LATHES



☐ 10" to 16-24" FLOOR LATHES



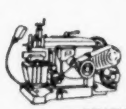
☐ DRILL PRESSES



☐ ½" & 1" Collet TURRET LATHES



☐ TOOL GRINDERS



☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

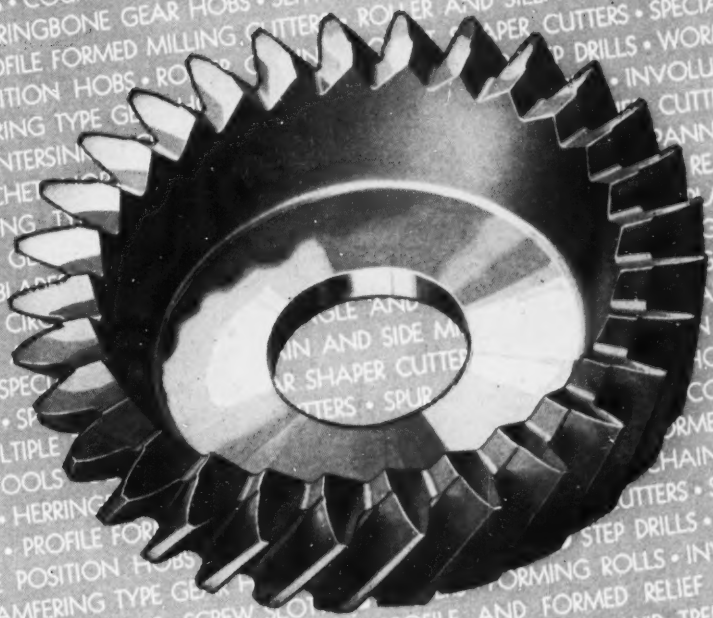
Building Better Tools Since 1906 • **SOUTH BEND LATHE** • South Bend 22, Indiana

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FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.





● Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

JET PARTS PRECISION-FORGED ON *MAXIPRESSES!*



● The forging of compressor blades and turbine buckets for jet aircraft engines demands the unparalleled ruggedness designed and built into the *new* MAXIPRES.

For this reason MAXIPRESSES are being chosen for the vast portion of the American, Canadian and British jet forging installations.

These fine, newly redesigned, high speed forging presses, embodying 23 new features, are specially suited to the most difficult present-day work, and by the same token will be the most reliable forge-shop equipment for future use as well.



NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO — SINCE 1874

DESIGNERS AND BUILDERS OF MODERN FORGING MACHINES • MAXIPRESSES • REDUCEROLLS • COLD HEADERS • BOLTMAKERS • NUT FORMERS • TAPPERS • NAILMAKERS

Hartford Detroit Chicago

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Jet Engines create *chucking* problems



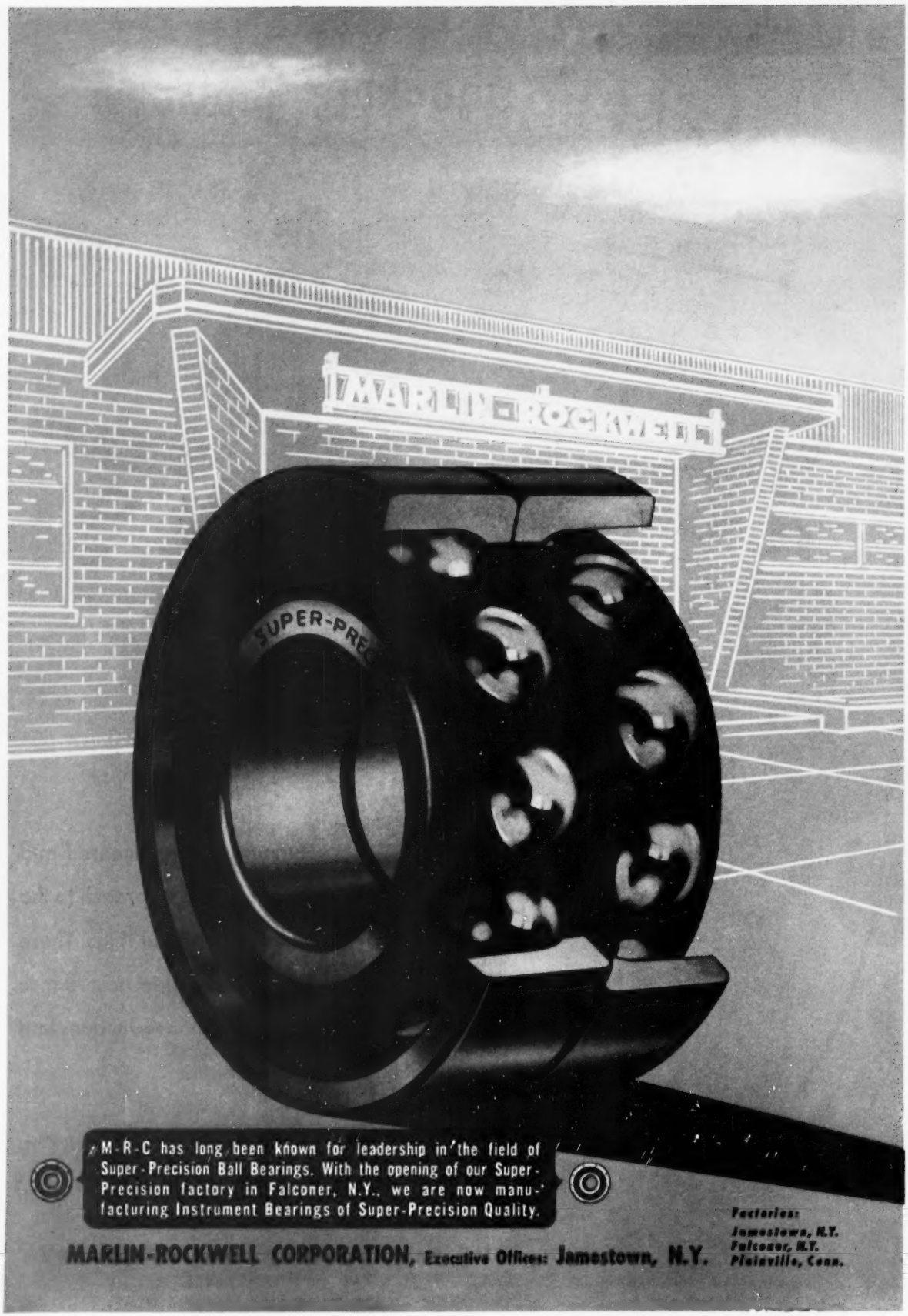
The Cushman Chuck Company has engineered and designed an entirely new and tested approach to the problem of holding jet engine discs and rings. These new chucks have been developed in strict accordance with the principles of rapid-production techniques and chucking rigidity *without* distortion.

Designed for both hand and automatic chucking operations. Engineered to your requirements.

THE CUSHMAN CHUCK COMPANY
815 WINDSOR STREET
HARTFORD 2, CONNECTICUT

12C552

A WORLD STANDARD FOR PRECISION



M-R-C has long been known for leadership in the field of Super-Precision Ball Bearings. With the opening of our Super-Precision factory in Falconer, N.Y., we are now manufacturing Instrument Bearings of Super-Precision Quality.

MARLIN-ROCKWELL CORPORATION, Executive Offices: Jamestown, N.Y.

Factories:
Jamestown, N.Y.
Falconer, N.Y.
Plainville, Conn.

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WHY IT PAYS TO BUY STEEL FROM WAREHOUSE



You don't get caught with steel you can't use!

WHEN YOU BUY STEEL FROM WAREHOUSE, YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

You can avoid this costly possibility by using the nearest U. S. Steel Supply warehouse as your own. From it, you can get the steel you need . . . in large or small quantities . . . cut to your specifications . . . delivered to your production area . . . at the time you desire. You run no risk of inventory obsolescence. Your U. S. Steel Supply salesman will help you put your steel purchasing on a most economical and efficient basis.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

USS

Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

WHEN SMALL PARTS GET

SMALLER

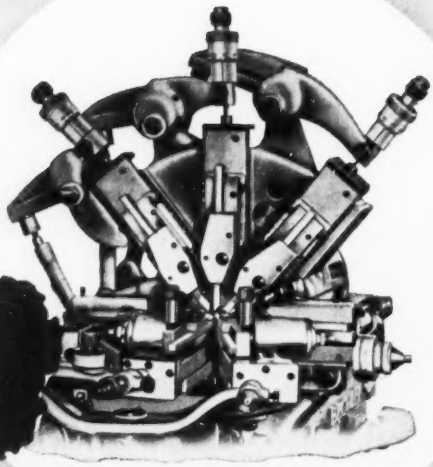
AND TOLERANCES GET

CLOSER

YOU NEED . . .

BECHLER

SWISS AUTOMATICS



Bechler Model A-10—
⅜" capacity.

When tolerances are too tight, and parts are too slender or intricate to be produced on ordinary screw machines, then Bechler genuine Swiss Automatics are probably what you need. Fifty years of experience have made Bechler the leading builders of Swiss type Automatics—and BECHLERS are SWISS-MADE.

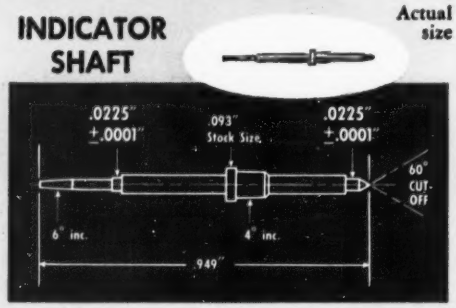
Bechlers do the job quickly, accurately, uniformly, and with exceptionally high finish. Five tool slides, with single-point tools, can be individually adjusted with micrometer screws. The two horizontal slides of the double tool attachment are used for undercutting and burnishing. Different models are available with capacities up to 1¼" diameter and 9" turning length.

Get in touch with us soon. Find out how Bechler can help you make better products to meet and beat higher and higher standards.

- **Service centers in New York and Los Angeles—factory trained men will plan layouts, produce tools, cams, and make set-ups.**
- **Complete stock of attachments, spare parts, and cams.**

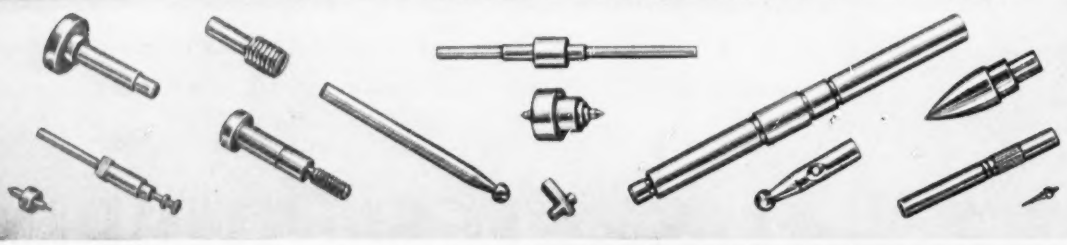
INDICATOR SHAFT

Actual size



material	stainless steel, type 303
precision	bearing diameters held to ± .0001"
finish on bearing surfaces	6 MIRMS
production time	30 seconds per piece
machine	Bechler, Model A-10

The Bechler Model A-10 can produce many different precision parts up to ⅜" dia., 2¾" long. Here are just a few, actual size:



COSA CORPORATION

405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.



Cylinder gears—ground on a Reishauer ZA.

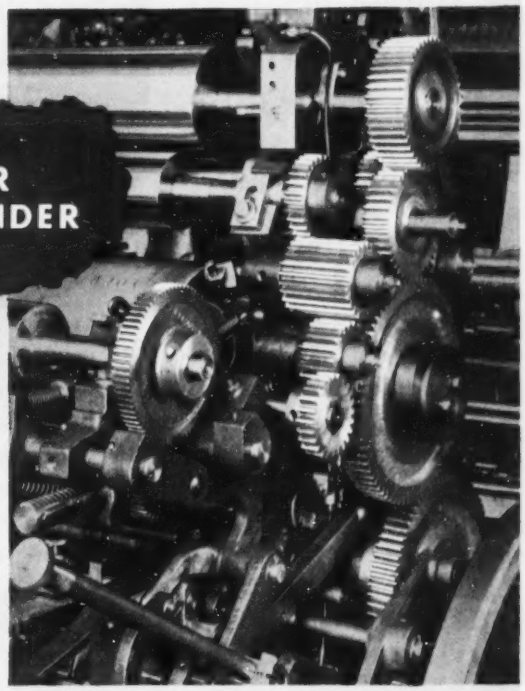
PRECISION GEARS...

the heart of fine printing presses...

are ground by AMERICAN TYPE FOUNDERS

on a

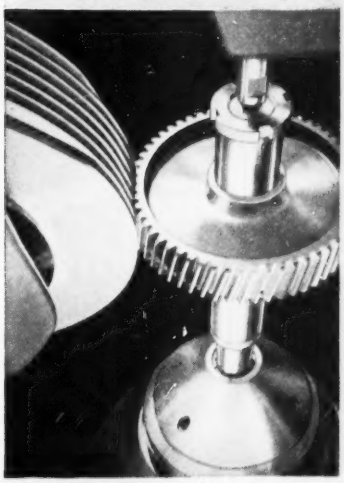
REISHAUER ZA GEAR GRINDER



Gear train on an ATF Press—ground on a Reishauer ZA.

Precision gears in a printing press are important, but cylinder gears on the ATF Chief are vital—they, in particular, must be accurately ground to prevent gear streaks on printed material, and they must be durable, to provide long-term accuracy. Therefore, ATF makes these gears from hardened alloy steel and precision-grinds them on the Reishauer ZA.

Heart of the Reishauer ZA—grinding wheel and spindle.



ATF is not alone in its respect for Reishauer's speed and accuracy—this machine is widely used to grind spur and helical gears in the automotive, aircraft, machine tool, gear-jobbing, and instrument industries.

Why is the Reishauer ZA so widely used? For one thing, it combines accurate grinding with production speed. For instance, floor-to-floor grinding time, on pre-hobbed gears, is about 8 to 13 seconds per inch-tooth.

There are many other reasons why the Reishauer ZA is the best production gear grinding machine you can get. If you want proof, we'll be happy to supply it. Get in touch with us soon, won't you?

COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

Prove It To Yourself!

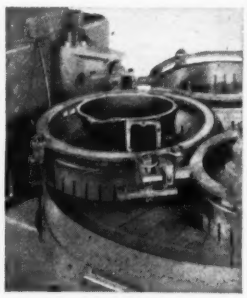


...You Can Now Obtain Precision Flatness, Finish and Parallelity in Production Quantities



Many manufacturers of pumps, compressors, valves and other equipment containing liquids or air under high pressures are now using production lapping to great advantage—have eliminated gaskets in mating surfaces, have improved product performance. This has been made possible through the extreme accuracy of work produced by the Lapmaster in production quantities. Micro-inch finishes of 2 to 3 RMS are common. Surface flatness can be held to less than .0000116".

A TYPICAL CASE



Four Model 72" Lapmasters were installed in an automotive plant for lapping the joint faces on large castings. These Lapmasters are able to keep pace with the high production requirements of automotive plants because there is no downtime required for reconditioning the lapping plate. In addition, parts lapped by the Lapmaster can be brought directly from the milling operation to lapping. Intermediate grinding operations are eliminated. Still another important feature is the fact that joint faces are lapped so accurately, gaskets can be eliminated in final assembly; the resulting metal to metal contact also eliminates distortion caused by the conventional use of gaskets.

Use Our

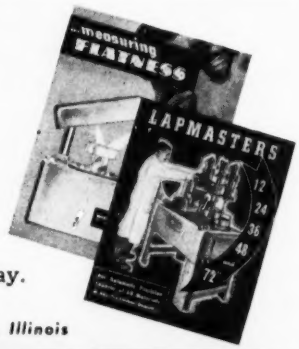
Free Laboratory Service

to Determine Your Exact Needs

To determine whether lapping can be practical and profitable for you, we maintain a laboratory for lapping sample parts. If you believe it offers possibilities we invite you to send prints of the parts, together with surface finish requirements and production desired. In addition send several parts for test lapping. We can then give you the facts on what you can expect from the Lapmaster. There is no obligation for this service.

Additional Data

on the complete line of Lapmasters is available on request, also new information on Measuring Flatness. Write for your copies today.



Crane Packing Company, Dept. M-12, 1833 Cuyler Avenue, Chicago 13, Illinois

JOHN CRANE

CRANE PACKING COMPANY

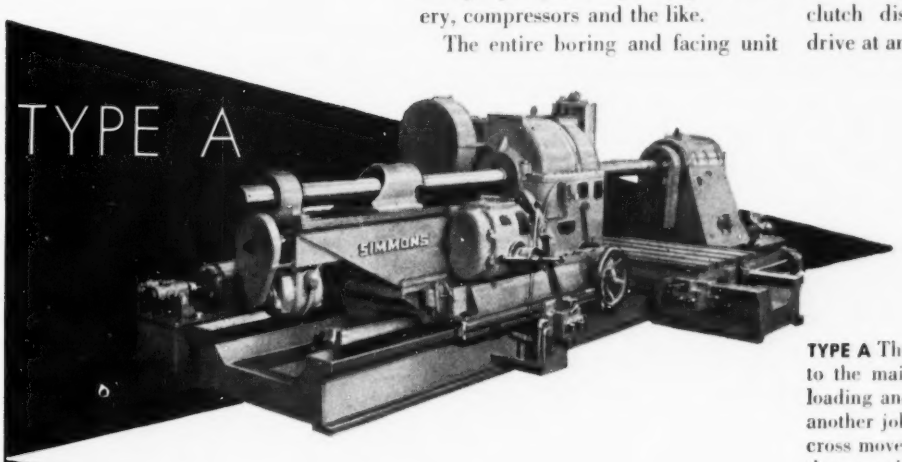
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EXTREME ACCURACY...HIGHER CUTTING SPEEDS...FASTER STOCK REMOVAL...

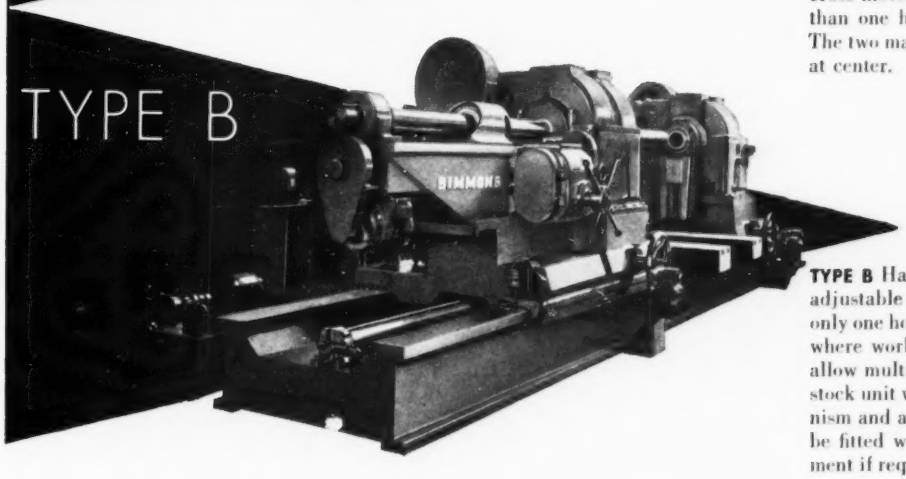
WITH SIMMONS 6" AND 8" BAR HORIZONTAL CYLINDER BORING AND FACING MACHINES

Power and rigidity...these Simmons machines have all you need to push carbide tooling through a full range of speeds and feeds. They're the production engineer's answer for large diameter cylindrical boring and facing jobs for steam turbines, diesel engines, centrifugal pumps, refrigerating machinery, compressors and the like.

The entire boring and facing unit on these Simmons machines is moved hydraulically along the bed; the boring bar has a mechanical screw feed; a power take-off for the feed gearing on the continuous feed facing head eliminates the usual star feed device and permits use of high-speed cutters for facing; an electrically-operated clutch disengages or reverses feed drive at any point.



TYPE A The traverse bed at right angles to the main bed allows 1) setting up, loading and unloading of one job while another job is being bored or faced; 2) cross movement of work on which more than one hole is to be bored or faced. The two main beds join this traverse bed at center.



TYPE B Has single in-line bed with two adjustable tables. Recommended where only one hole is to be bored and faced, or where work is too large or unwieldy to allow multiple mounting. Has one headstock unit with boring and facing mechanism and auxiliary headstock which can be fitted with boring and facing equipment if required.

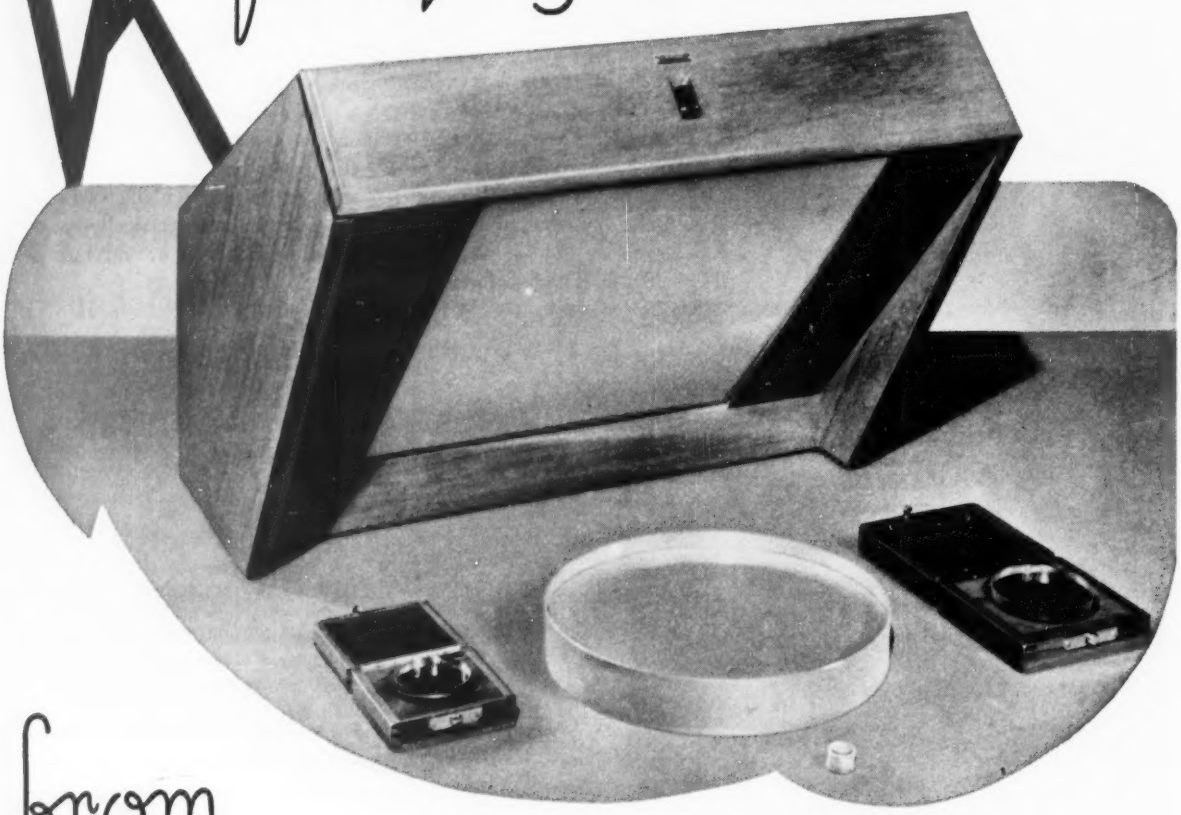
BOTH TYPES are of "unit-type" construction and, to meet your particular production requirements, modifications can be made in specification of swing, bar diameter, bar length, bed length, table area and travel or spindle speeds.

Write, wire or phone today for complete engineering information.

SIMMONS MACHINE TOOL CORPORATION
1600 North Broadway, Albany 1, New York
New York Office: 50 East 42nd Street
Phone in Philadelphia: Victor 8-3133
Phone in Pittsburgh: PEnhurst 1-3700

SIMMONS FOR THE LARGE SPECIAL MACHINE TOOLS THAT OTHERS SELDOM BUILD

VK fused quartz OPTICAL FLATS



from

½" diameter up.... accurate to .000001"

With VK Optical Flats, close checking of flat surfaces is simplified and more conveniently handled.

Shown here is the new Van Keuren monochromatic light, 22¼" wide, 17¼" high and 20" deep (in bench space). It is designed for use with large optical flats such as the one shown—a 10" diameter fused quartz double-surface master flat (accurate to .000001" both sides).

VK Optical Flats are available in sizes from ½" diameter to 10" diameter in .000001", .000002" or .000004" accuracy. They can be shipped within 30 days from order.

Catalog and Handbook No. 35 is available by writing: The Van Keuren Co., 178 Waltham St., Watertown, Mass. Ask for your copy.

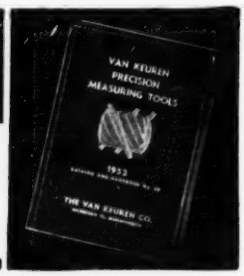
VK

34th YEAR

THE Van Keuren CO.

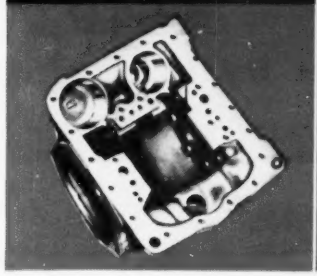
178 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires Chrome Carbide Taper Insert Plug Gages

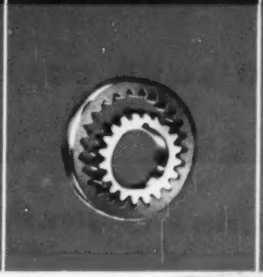


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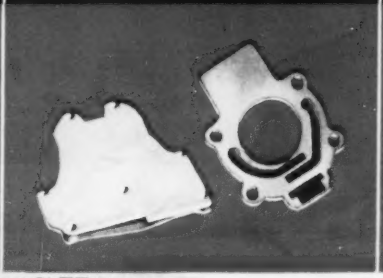
TRANSMISSION CASE (CAST IRON) THREE TYPE I, ONE TYPE III SURFACES



PUMP GEARS (CAST IRON; STEEL) SIDE SURFACES, TYPE IV



TRANSMISSION COVER AND GOVERNOR BODY (BOTH ALUMINUM) TYPE III SURFACES



PINION GEARS (HARDENED STEEL) THREE TYPE II, TWO TYPE IV SURFACES



FOR PRECISION FINISHING OF FUNCTIONAL SURFACES

PowerFlite transmission parts are *Microhoned*

Chrysler engineers, with years of proficiency in production-processing of precision parts, have specified the Microhoning process as the method for obtaining

✶ DIMENSIONAL ACCURACY ✶ GEOMETRIC PRECISION ✶ CONTROLLED SURFACE FINISH

required for the efficient functioning of the new PowerFlite transmission.

FOUR TYPES OF SURFACES IN THE *PowerFlite* ARE MICROHONED:

Type I—Cylindrical surfaces through which a piston or valve moves.

These surfaces must be round, straight and accurately sized, with a controlled surface finish—in order to minimize wear and eliminate oil leakage. The Microhoned finish assures non-flaking surfaces between the stationary and moving parts.

Type II—Cylindrical surfaces in rotating parts.

Microhoning maintains concentricity of pitch diameter of teeth and the bore of gears, permitting teeth to mesh with minimum noise and wear. The bore must have precise geometry, size, and functional finish to retain a lubricating film at high speed.

Type III—Flat surfaces that are bolted together without a gasket.

They must be flat enough so that they will not distort when pulled together, and must have a surface finish that will mate to form a tight, effective seal.

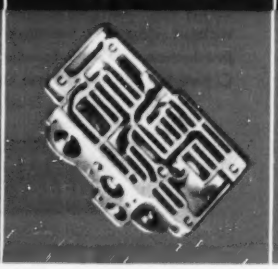
Type IV—Flat surfaces that move in contact with stationary surfaces.

These must be smooth and flat in order to minimize friction and wear, and maintain a "running seal", thus eliminating leakage.

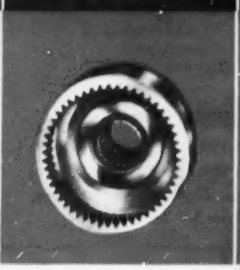
For more information on the Microhoning process write to:
Field Engineering B7
Micromatic Hone Corporation
8100 Schoolcraft Avenue
Detroit 38, Michigan



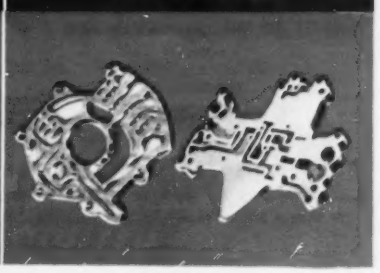
VALVE BODY (ALUMINUM) TWO TYPE III, ONE TYPE I SURFACES



KICK-DOWN GEARS (STEEL) TYPE IV SURFACES



TRANSFER PLATE AND REGULATOR BODY (BOTH STEEL) TYPE III SURFACES



MICROHONING MACHINES • TOOLS • FIXTURES • ABRASIVES

MICROMATIC HONE CORPORATION
8100 Schoolcraft Avenue, Detroit 38, Michigan

MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
Boston Post Road
Guilford, Connecticut

MICROMATIC HONE CORP.
614 Empire Building
206 So. Main Street
Rockford, Illinois

MICROMATIC HONE CORP.
1535 Grande Vista Avenue
Los Angeles 23, California

MICROMATIC HONE LTD.
330 Grand River Avenue
Brantford, Ontario, Canada

MICROMATIC HONE CORP
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

REPRESENTATIVES:

Overgard Machine Tool Company, 234 Commonwealth Bldg., Denver 2, Colorado • Allied Northwest Machine Tool Corp., 103 S. W. Front Ave., Portland 4, Oregon
REPRESENTATIVES IN ALL PRINCIPAL COUNTRIES



FOR DRILLING, REAMING AND TAPPING

DRILL AND TAP CHUCKS



☐ **Style "B" Drill Chucks** for straight shank tools. Full range of standard chucks, with A.S.A. or Morse taper shank. Save tool costs by replacing taper shank drills with jobber length drills.

☐ **Style "A" Tap Chucks** give true collet action on tap shank. Speed tool changes; improve accuracy. High tensile strength.



☐ **Style "B" Center Drill Drivers,** with Morse taper shanks, in 15 sizes—⅛" x 3/64" to ¾" x 5/16" center drill size. Flutes drive off splined bore. Countersink hole protects drill tip.

TAP HOLDERS AND DRIVERS

☐ **Heavy-duty Tap Holders** drive large taps with ease; keep them running true. Broached square drive. Standard sizes for range of hand and pipe tap sizes, from ¾" to 3".





☐ **Close-center Tap Drivers** give maximum clearance between centers. Collet action minimizes strain, saves taps. Short, medium and long series convert spindles for most tapping needs.

☐ **Tension and Compression Tap Holders** compensate for variations between feed and tap pitch; protect machines and tools. Style "C" for feed less than tap lead; Style "D" for feed greater than lead.



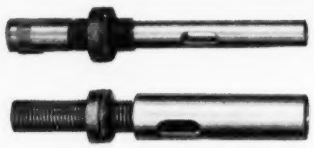


☐ **Drill Stops** give positive, accurate control over depth of hole, stopping on work or fixture bushing. Eight standard sizes, with Morse taper shanks and hole diams. from ¼" to 1½".

ADJUSTABLE ADAPTERS

☐ **Quick-lock Adjustable Adapters** permit fast, accurate depth adjustments in cluster of spindles. Maintain original accuracy of spindle when locked in place; speed tool changes. Standard sizes for most multiple-spindle tools.





☐ **Spindle Extension Assemblies,** for driving shank-type tools in multiple-spindle machines, accurately control depth of hole. Style 1800 for shank diams. from ¾" to 1⅞". Style 1900, from ⅝" to 1⅜".

FLOATING HOLDERS

☐ **Style "JA"** gives free unrestricted float in all directions. Compensates for spindle or work misalignment; prevents tool breakage. A.S.A. or Morse taper collet; taper or threaded adapter shank.





☐ **Style "JT"** for multiple-spindle machines gives unrestricted float; permits accurate depth adjustment. Reduces scrap and tool breakage. Standard holders for most requirements.

QUICK-CHANGE CHUCKS

☐ **Quick-change Chucks** permit fast, easy tool changes without stopping machine. Increase production on single-spindle machines. Collets for A.S.A. or Morse taper shank.



SLEEVES, SOCKETS, TURRET TOOL HOLDERS



☐ **Style 100-D Precision Sleeves** reduce any A.S.A. or Morse taper hole to smaller taper. Hardened and ground. Style 100 "Use-Em-Up" Sleeves also available.

☐ **Style 100-W Extension Sockets** extend and convert spindles to larger or smaller taper. Short, medium and long series in standard sizes for most needs.



Precision Holding Tools do you need—

your cutting tools to the machine and the job?

CALL YOUR LOCAL SCULLY-JONES REPRESENTATIVE LISTED HERE!



FOR INTERNAL AND EXTERNAL CHUCKING OF PARTS AND TOOLS

"ROLL-LOCK" CHUCKING TOOLS



☐ **Flange-type Chucks** provide accurate, centering shrink fit by compressing holding surface. Quickly, easily operated by hand; 13 sizes, from ½" to 4" bore.



☐ **Style "K" Expanding Mandrels** available in 5 standard sizes, from ½" to ¾" dia. Style "B" in 13 sizes, from 13/16" to 2¼" dia. Style "J," 6 sizes, from 2½" to 4½" dia.

☐ **Expanding Mandrels** for tool room grinding: 8 sizes, from ⅝" to 2" dia.



☐ **Flange-type Expanding Arbors:** 23 sizes, from ½" to 4" dia.

☐ **Expanding Milling Arbors** have N.M.T.B. taper shanks; 8 sizes, from ¾" to 2" dia.

☐ **Tool Chucks:** variety of sizes and shank styles available.

FOR MILLING

ARBORS AND ADAPTERS



☐ **Style "A" Arbors,** with pilot end support, for machines with National Standard spindle end and nonsticking 3½" per foot taper hole. Range of sizes; 40 and 50 N.M.T.B. standard tapers.

☐ **Style "B" Arbors,** without pilot. Available in range of sizes with 40 and 50 N.M.T.B. standard tapers.



☐ **Shell End Mill Arbors** available in range of sizes and styles. Collet Holders, Cutter Shank Adapters, Centering Plugs, and other Adapters available to meet your needs.

☐ **Solid Spacing Collars** have faces lapped parallel within .0002"; keep cutters running true. Many standard sizes, from .006" to 6" thick, ⅞" to 2½" bore.



☐ **Arbor Bearing Sleeves** for standard "A" and "B" size arbors. Bore and O.D. within .0005", faces within .0002"; ⅞" to 2½" bore size.

☐ **Adjustable Spacing Collars** quickly, easily give odd decimal lengths between cutters; 7 sizes, from ¾" to 2½" bore.

CALIFORNIA
Los Angeles
Allied Tool & Abrasive Sup. Co.
Almquist Brothers
Machinists' Tool & Supply Co.
Oakland
Mechanics Tool & Supply Co.
San Diego
Production Tools, Inc.
San Francisco
Joseph C. Fletcher
San Jose
Industrial Tool & Supply Co.
CONNECTICUT
West Hartford
The Robert E. Morris Co.
ILLINOIS
Chicago
Boyd-Wagner Co.
Charles Products Co.
Screw Machine Supply Co.
Supplies, Inc.
INDIANA
Ft. Wayne
Bowen Conn
Indianapolis
Gurley-Ortman Indiana, Inc.
The E. A. Kinsey Co., Inc.
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MICHIGAN
Detroit
Scully-Jones & Co.
Flint
Bobier Tool Co.
Grand Rapids
Grand Rapids Supply Co.
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C. E. Hamlin Co.
Kalamazoo
Kendall Hardware-Mill Sup., Inc.
Lansing
Sturm Tool Supply Co.
Muskegon
Lakeshore Machinery & Sup. Co.
Saginaw
Mahar Tool Supply Co., Inc.
MINNESOTA
Minneapolis
Walter R. Hammond Co.
MISSOURI
Kansas City
Eichman Machinery Co., Inc.
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NEW YORK
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Elmira
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New York
Galvin Tool Sales Co.
Schenectady
Frank A. Hart in Rhinebeck
OHIO
Cincinnati
The E. A. Kinsey Co., Inc.
Cleveland
Oliver-Ingalls Associates
Columbus
The E. A. Kinsey Co., Inc.
Dayton
The Dayton Supply & Tool Co.
The E. A. Kinsey Co., Inc.
OKLAHOMA
Tulsa
Precision Tool Sales
OREGON
Portland
The General Tool Co.
PENNSYLVANIA
Erie
James H. Cross Co.
Philadelphia
Hoffman-Baumruck Co.
Pittsburgh
Harris Pump & Supply Co.
TEXAS
Dallas
Tool Supply & Engineering Co.
Houston
Dolan Industrial Sales
WASHINGTON
Seattle
Dawson Tool & Abrasive, Inc.
WISCONSIN
Milwaukee
Rickert Industrial Supply Co.

SCULLY-JONES

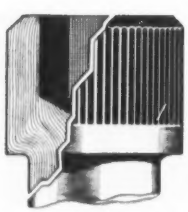
Precision Holding

FOR HOLDING PRECISION

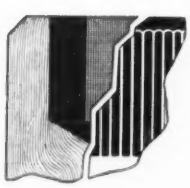
Scully-Jones and Company, 1906 South Rockwell St., Chicago 8, Illinois

For more information on products advertised, use Inquiry Card, page 247

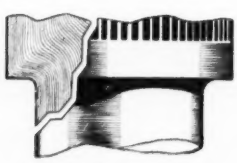




HEAD. Forged for maximum physical strength. Diameter and height are precision controlled — any deviation could be serious. Knurls, originated by SPS, provide easier handling and faster assembly by oily fingers.



SOCKET. Uniform depth and size assure strength and maximum torque in wrenching — extremely important in a socket cap screw.



FILLET. Completely formed to provide maximum resistance to shear and continuous grain flow throughout length of screw.



There's much more to an UNBRAKO than meets the eye

When you pick up a socket cap screw, you don't stop to examine it—it's so commonplace.

If you did, and it's an UNBRAKO, you'd marvel at the knurled head, the uniform hex socket, the smooth shank, the precision threads, all combined to make a strong, close tolerance fastener.

Quality control—from the selected alloy steels to the finished product—makes an UNBRAKO Socket Cap Screw what it is, the finest you can buy. Write for UNBRAKO Standards. SPS, Box 19, Jenkintown, Pa.

UNBRAKO® SOCKET SCREW DIVISION

Stocked and sold by leading industrial distributors everywhere

SPS
JENKINTOWN PENNSYLVANIA



THREADS. Fully formed to maintain continuous grain flow and prevent shearing. Made to Class 3 fit. Controlled fillet at root of threads gives added tensile and fatigue strength.



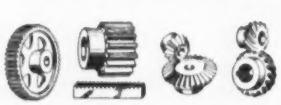
UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

means approval by 250,000 cost-wise buyers

EQUIPPED WITH BOSTON Gear STANDARDIZED PRODUCTS



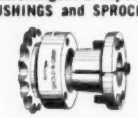
STOCK GEARS — 2000 TYPES and SIZES



SPROCKETS and CHAIN



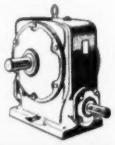
SHOLD-A-GRIP Interchangeable Tapered BUSHINGS and SPROCKETS



RATIOMOTORS



REDUCTORS



A $10,000,000 STOCK • AT 92 LOCAL DISTRIBUTORS

SHAFT SUPPORTS



UNIVERSAL JOINTS



COUPLINGS



Gives your product preferred rating

...the lift that swings more sales



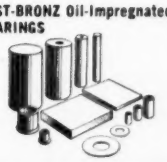
It makes sense to team up with the leader.
Choose BOSTON STANDARD STOCK gears and related drive components for your product. Here's why:

1. **LEADING SPECIALISTS** in standardized machine drive parts for 75 years.
2. **LARGEST PRODUCTION** facilities, serving 250,000 customers in all industries.
3. **HIGHEST QUALITY.** Assures immediate interchangeability, anytime, anywhere.
4. **LOWER COST** Longest service life assured by BOSTON Gear quality.
5. **5112 STOCK ITEMS** Broadest range of standard styles and sizes.
6. **NEARBY STOCKS,** at leading supply centers . . . the nation-wide network of 92 BOSTON Gear Distributors . . . with stocks totaling $10,000,000.

These are more than advantages . . . they are *essentials* to trouble-free planning and servicing of any product assembled with standardized parts. Only BOSTON Gear offers them *all.* Compare — and you'll agree — it pays to "Design around BOSTON Gear".

For information on any product, see your nearby Distributor. When desired, he'll arrange consultation with a BOSTON Gear Field Engineer. Boston Gear Works, 65 Hayward St., Quincy 71, Mass.

BOST-BRONZ Oil-Impregnated BEARINGS





Get Catalog No. 55
Industry's most valued "textbook" of drive design and maintenance . . . includes 30 pages of Engineering data.

BOSTON Gear®

FOR PROMPT DELIVERIES AT FACTORY PRICES

BALL BEARINGS

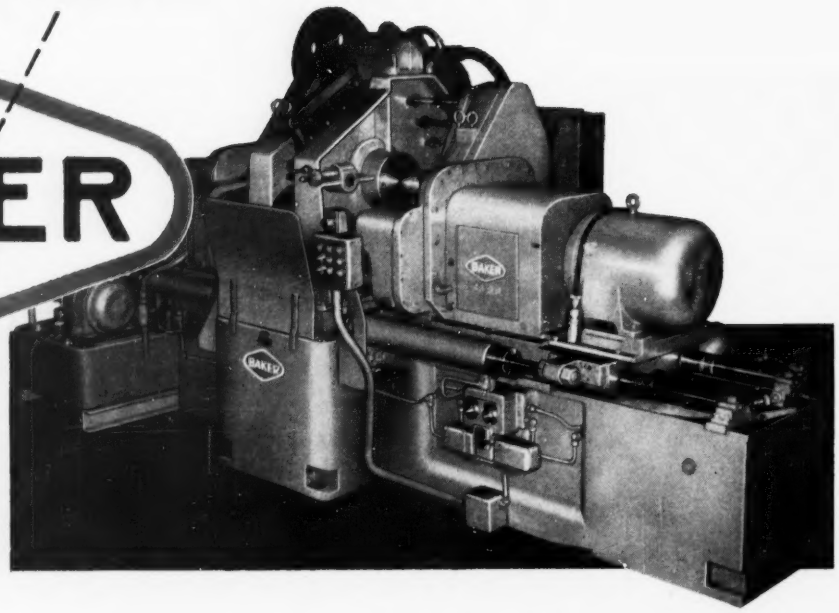


Look under "Gears" in the Yellow Classified Section of your Telephone Directory for the BOSTON Gear Distributor nearest you.

Modern Machine Tools..

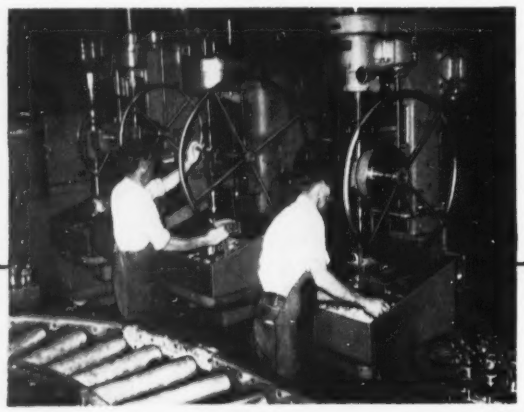
SLASH PRODUCTION COSTS!

New
BAKER
Method



1 Operator . . .
1 Machine . . .

Multi-Operations Fully Automatic On 4 Parts Simultaneously—Load—Drill—Core Drill—Ream—Unload



THE OLD METHOD —

2 OPERATORS . . 4 MACHINES . .

Hand Controls + Excessive Handling + Capstan And Hand Engagement Of Feed + Operator Fatigue = Low Production Rate At High Cost.

INCREASE PRODUCTIVITY .. with a NEW BAKER 'Special'

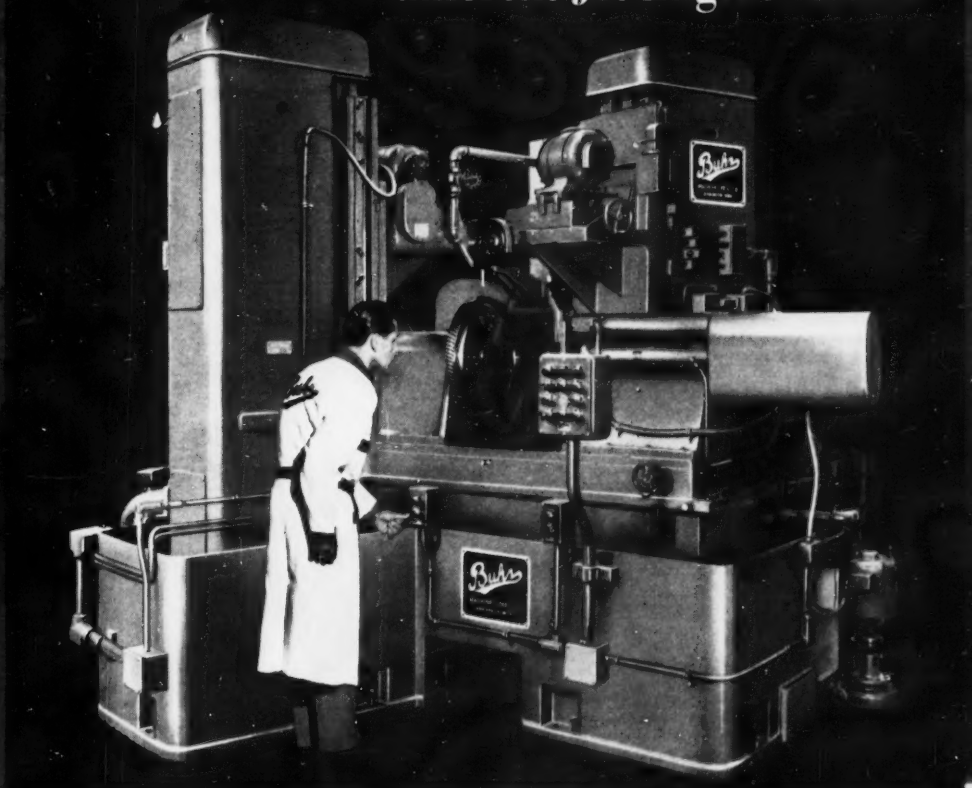
WRITE REGARDING YOUR SPECIFIC JOB PROBLEMS...

BAKER BROTHERS, INC. Toledo, Ohio
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

For more information on products advertised, use Inquiry Card, page 247

Buhr SPECIAL...

Mills both ends of 57 up to 103 slots in 16 different Jet Engine Rotors



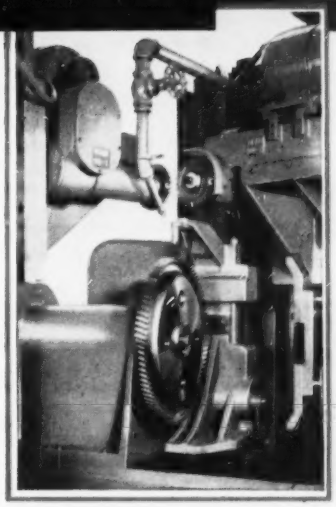
Automatic 2-spindle milling machine, arranged with automatic index for milling both ends of dove-tailed slots.

Equipped with hardened and ground laminated tool-steel ways.

Hydraulic and electrical installations to J.I.C. standards.

Automatic index unit arranged for milling the various stages from 57 up to 103 slots.

Once machine is set up for any one part, operation is fully automatic, including stop when part is finished.



BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN

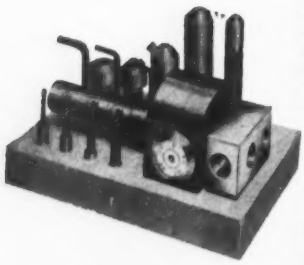
Buhr **MULTIPLE-SPINDLE HIGH PRODUCTION MACHINERY**

PLAN for TOMORROW . . . by making the *Bridgeport* TURRET MILLING MACHINE a "MUST" for TODAY

Many shops have modernized their production methods by replacing obsolete equipment with BRIDGEPORT MILLERS . . . the machines that mill, drill, bore and shape at all angles with one set up.

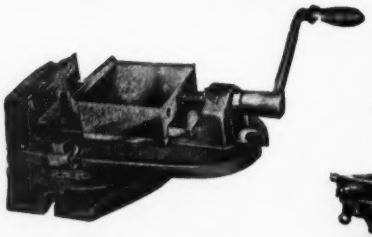
These shops *planned* for the future when they installed "BRIDGEPORTS" in their tool rooms, die shops and production lines. They were convinced by the experience of others that their moderate investment in modernization would be returned quickly through economies they could effect, and that obsolescence would be deferred for many years to come.

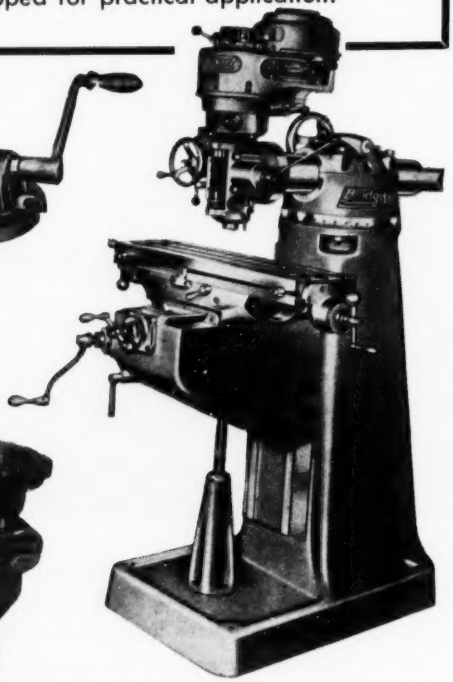
A most plausible reason for the long time economy of the "BRIDGEPORT" is not merely its faster, more convenient and closer accuracy in handling a wide range of work but because improved methods over those offered by Bridgeport Turret Milling Machines have yet to be developed for practical application.



MILLING MACHINE VISE

This improved vise provides great gripping power, is streamlined for appearance and equipped with coolant trough. Rigid holding is assured by large diameter screw. Two sizes; 5"x3½" and 6"x5" jaw openings.





NO. 2 BORING HEAD

Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



RIGHT ANGLE ATTACHMENTS

(Left) *Heavy Duty* . . . For milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.

(Right) *Light Duty* . . . for right angle milling and drilling narrow, deep molds and cavities.



Ask your dealer . . . or us . . . to show you how you can make the "BRIDGEPORT" pay you handsome returns.

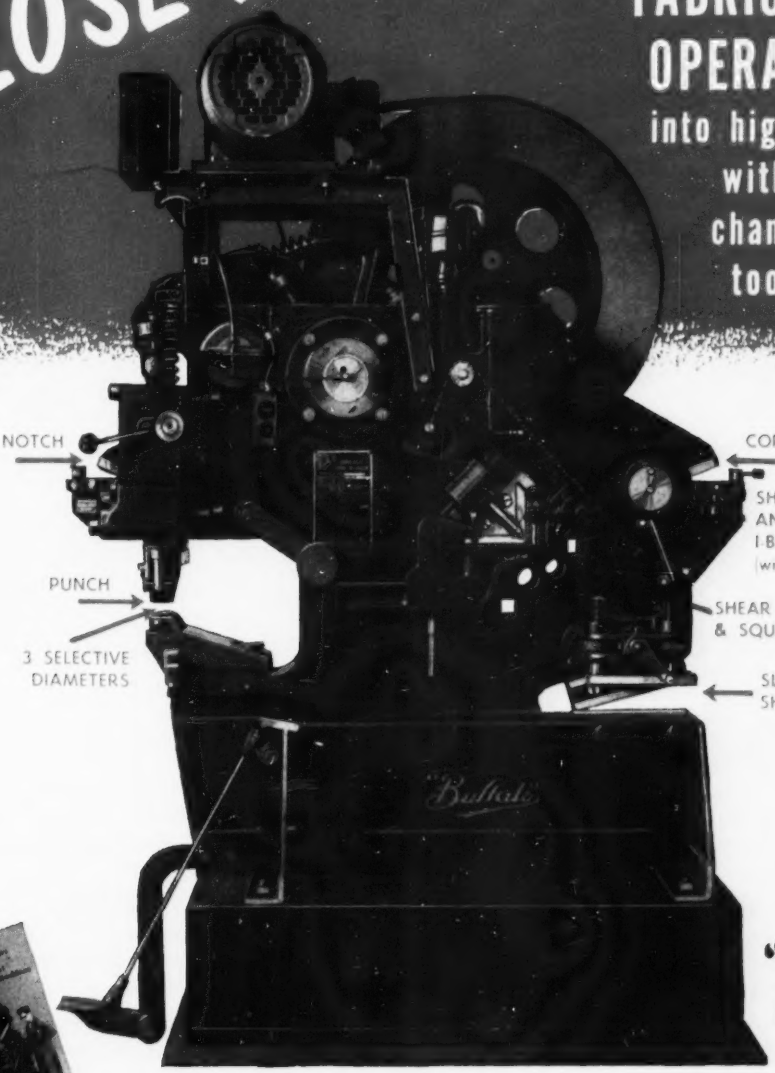
Bridgeport MACHINES, INC.

Bridgeport, Connecticut

Manufacturers of High Speed Milling Attachments and Turret Milling Machines

For more information on products advertised, use Inquiry Card, page 247

TAKE A CLOSE LOOK— at the single machine that can put all these FABRICATION OPERATIONS into high gear— without changing tools!





Write for Bulletin 360 Today.

"Buffalo" UNIVERSAL IRON WORKER

"Takes the space of one machine — takes the place of five"

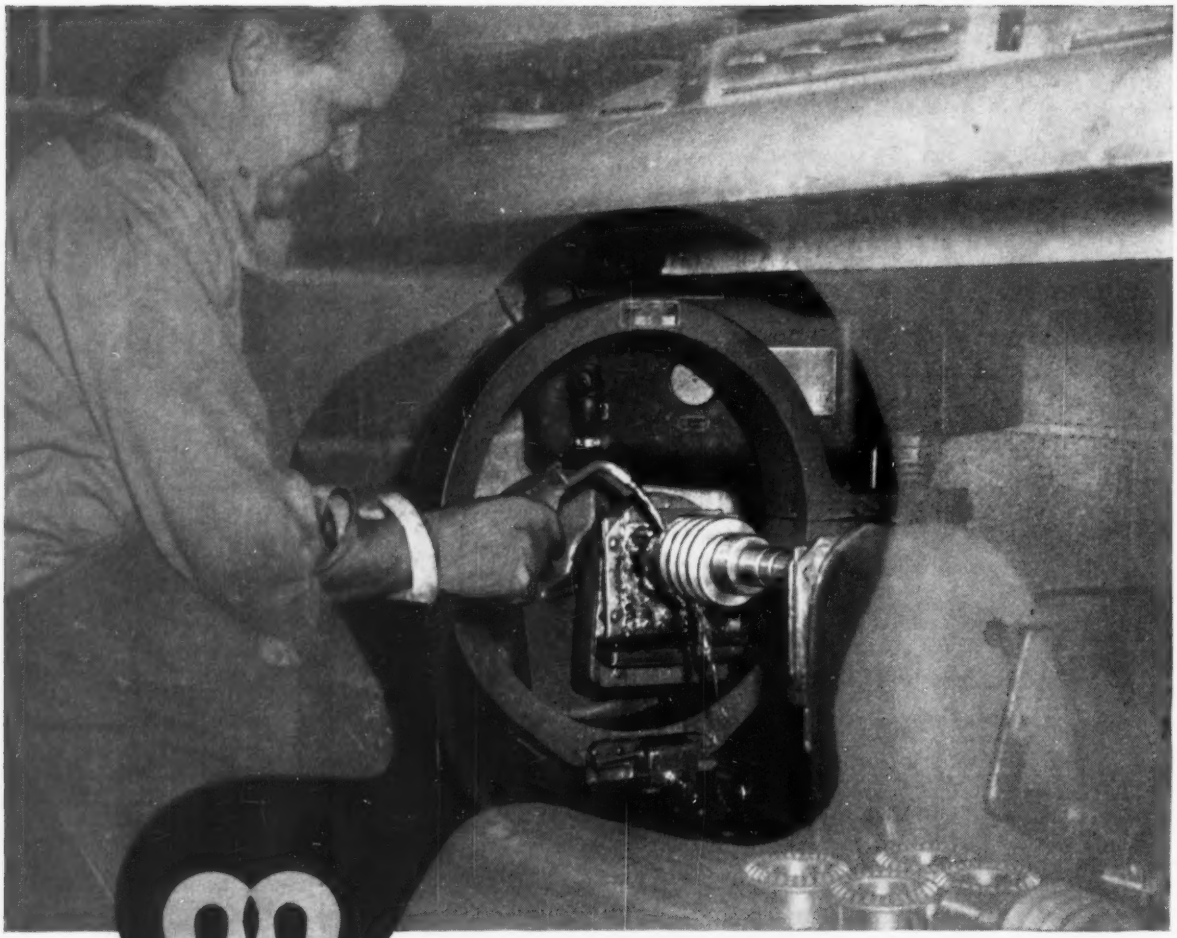
"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

440 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co, Ltd., Kitchener, Ont.

DRILLING PUNCHING CUTTING SHEARING BENDING



Magnaflux

The inspection with Magnaflux detects hidden defects in the structure of metals. As applied to the manufacture of BRAD FOOTE gears, Magnaflux will point out the presence of even a minute, embedded imperfection that would prevent the gear or pinion from giving the ultimate service.

• Magnafluxing is one of a series of tests and controls employed by BRAD FOOTE. It helps to perpetuate the high quality which is traditional in gears made by BRAD FOOTE. It is another reason why you can order with confidence that the gears you receive will give you complete satisfaction.

• BRAD FOOTE makes all types of gears and pinions, and many styles of gearmotors, reducers, and transmissions. Our engineering staff will work with you on the design of any special gear or assembly you may need for your shop—or for use on equipment you make to sell.

• The complete facilities of the BRAD FOOTE organization are available whether you need one or scheduled quantities. We believe you will find satisfaction in working with us. Consider sending us your next inquiry which will receive prompt attention.



BRAD FOOTE GEAR WORKS, INC.

1309 South Cicero Avenue • Cicero 50, Illinois
Bishop 2-1070 • OLympic 2-7700

subsidiaries

AMERICAN GEAR & MFG. CO. • Phone: Lemont 920 • Lemont, Illinois

PITTSBURGH GEAR COMPANY • Phone: ATlantic 1-9950 • Pittsburgh 22, Pennsylvania

For more information on products advertised, use Inquiry Card, page 247

for machining, grinding and presswork

A UNIVERSAL COOLANT-LUBRICANT



GRINDING COSTS CUT 4 WAYS

WITH SHEAR-SPEED SOLUBLE OIL

- less down-time
- longer wheel life
- fewer wheel dressings
- more parts per dressing

Convince yourself of the **amazing** advantages and versatility of SHEAR-SPEED Soluble Oil in your own plant. Sold only on a **satisfaction guaranteed** test basis. Write for **Bulletin SO-53** and price list.

IMPARTIAL TEST RESULTS: two highly-rated soluble oils vs. SHEAR-SPEED Soluble Oil tested under similar conditions in actual production of machine tool parts.

same machine and coolant flow all tests; parts 65 Rockwell C; vitrified 60 grit wheel @ 6280 sfpm.

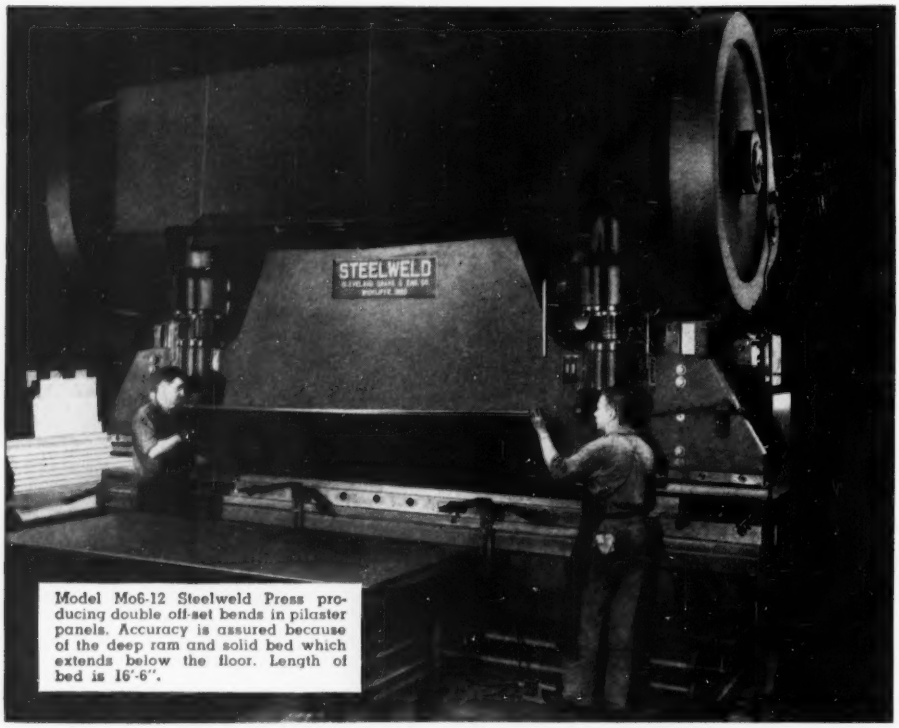
	Soluble X	Soluble Y	SHEAR-SPEED Soluble Oil	S/S Soluble Oil Gave this:
Wheel Loading	Very Rapid Loading	Rapid Loading	No Loading	55% Increase Depth of Cut
Finish	Finish Grind Required	Finish Grind Required	No Finish Grinding	Lower Cost Per Piece
Coolant Temperature	Rapid Increase	Rapid Increase	Very Slight Increase	Decreased Work Distortion

SHEAR SPEED
CHEMICAL PRODUCTS

7125 E. McNICHOLS RD. *A Division of Michigan Tool Co.* DETROIT 12, MICH.

Special Press features

SPEED PRODUCTION



Model Mo6-12 Steelweld Press producing double off-set bends in pilaster panels. Accuracy is assured because of the deep ram and solid bed which extends below the floor. Length of bed is 16'-6".

It takes power to make long sharp bends. It takes size and design to assure accuracy. The Mills Company, Cleveland, Ohio, well-known manufacturers of fine metal partitions achieve both with their big 500 ton capacity Steelweld Press.

But more! They also obtain speed and safety. Their machine is provided with several features that are extremely advantageous:

1. Air-electric control for high production.
2. Electric foot switches for easy fatigueless operation.
3. Ram-positioning selector for stopping ram automatically at pre-selected points.
4. Two speeds, 7 or 21 strokes per minute for best operating speed.
5. Reversing flywheel for quick stopping or reversing of ram at any point.
6. Safety dual control permitting operation only when both operators are ready.

The Mills Company are proud of their modern Steelweld Press. It is the largest of several press brakes in their plant. It is in continuous operation, two shifts a day.



GET THIS BOOK!

CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

5420 EAST 281 ST., WICKLIFFE, OHIO

STEELWELD

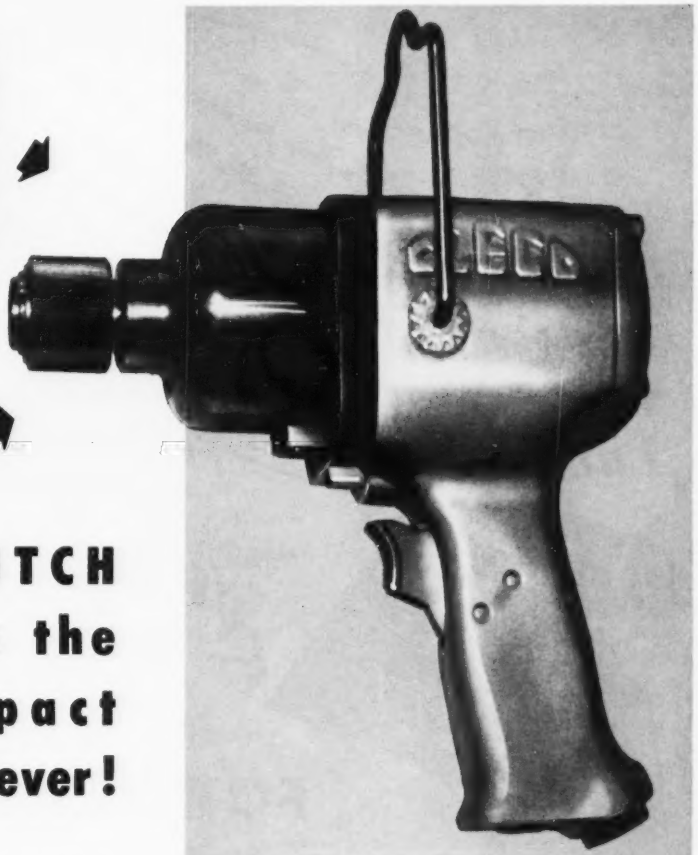
BENDING PRESSES

BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

For more information on products advertised, use Inquiry Card, page 247

The new A3-SQ Reversible Impact Wrench with integral 7/16" hex. quick-change chuck for screw driving.

New shape of steel housing gives better view of work.



NEW STEEL CLUTCH HOUSING makes the CLECO A-3 Impact Wrench better than ever!

The Cleco A-3 reversible pneumatic impact wrench is a rugged production tool that features a powerful air motor and a patented impact mechanism that uses no springs or other fragile parts.

The steel clutch housing (available as optional equipment on the A-3 Impact Wrench) is also furnished with ½" square drive. Specify Model A-3S.

3" or 6" extended spindles are also available at no extra charge.

Ask your Cleco representative, or write us direct, for a demonstration in your plant.

SPECIFICATIONS A3-SQ WRENCH

Capacity	**⅜" bolt or stud**
Weight	**5 lbs.**
Over-all length	**7⅛"**
Spindle offset	**⅞"**

Bail furnished, if specified, at no extra cost.

CLECO AIR TOOLS

DALLETT

CLECO DIVISION

of the REED ROLLER BIT COMPANY, 5125 Clinton Drive, Houston 20, Texas, U. S. A.

AIR TOOLS FOR EVERY PURPOSE

- Grinders • Sanders • Rotary Drills • Riveters • Backfill Tampers
- Chippers • Scaling Tools • Impact Wrenches • Screwdrivers • Sump Pumps
- Paving Breakers • Spike Drivers • Air Line Accessories and Fittings

In Canada: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Toronto (Leaside), Ontario

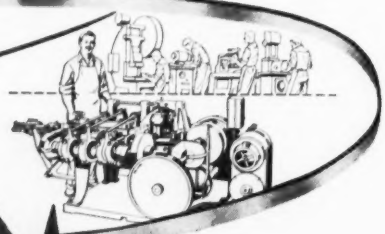
4586

For more information on products advertised, use Inquiry Card, page 247

Save Metal

Save Labor





NILSON FOUR-SLIDE

Wire and Ribbon Metal

FORMING MACHINES

Starting from a coil of wire or ribbon metal, NILSON FOURSLIDES straighten, feed, pierce, blank, swage, stamp, or coin, cut-off and form up to 300 precision parts per minute—ALL AUTOMATICALLY.

Save Metal—NILSON FOURSLIDES permit stamping and forming to full width of material with minimum scrap and spoilage.

Save Labor—By combining press and forming operations, secondary handlings are eliminated. Greater production at lower unit cost.

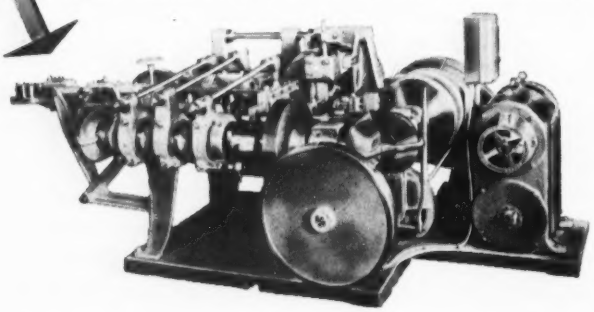
THERE'S NOTHING LIKE A NILSON

Send us a sample or print of your product or parts for specific recommendations.

THE A. H. NILSON MACHINE COMPANY

1518 Railroad Avenue • Bridgeport 5, Connecticut

CHICAGO • CLEVELAND • DETROIT • LOS ANGELES • HAMILTON, ONT., CANADA



NILSON has been specializing in Forming Equipment for over 50 years.

Range of Sizes:

Wire Forming: 1/32" thru 1/2".

Ribbon Metal: 1/32" thru 3 1/2" wide.

Press section capacities: 5 to 30 tons

50 to 75 tons in heavy duty types.

For more information on products advertised, use Inquiry Card, page 247

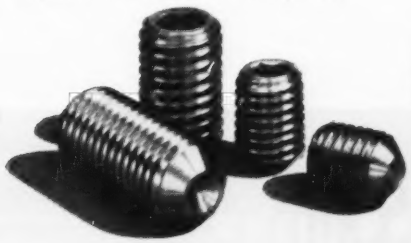


NEW *Allenpoint Set Screws*

WITH SCIENTIFICALLY-DESIGNED SMALLER CUP POINTS

Tested comparatively by United States Testing Company* with standard cup point screws and screws with angled and serrated points, the new Allenpoint demonstrated (1) greater locking power at *all* measured installation vs removal torque pressures, (2) uniformly high shaft holding power in torque resistance tests, (3) unmatched performance under vibration, and (4) more complete shaft contact pattern. Sold *only* by leading Industrial Distributors. Write us for more facts about the results of these important tests of set screw performance.

**Report No. E 5576, March 17, 1953.*



ALLEN

MANUFACTURING COMPANY

Hartford 2, Connecticut U.S.A.

ALLEN HEAD

Product Directory

To find headings easily, look for capital letters at top of each page to denote locations.

ABRASIVE CLOTH, Paper and Belt
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

ABRASIVES
See Discs, Abrasive

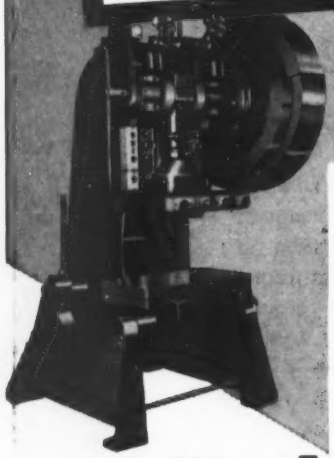
ABRASIVES, HONING
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.

ABRASIVES, Polishing, Tumbling, Etc.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill..
Norton Co., 1 New Bond St., Worcester 6, Mass.
Simonds Abrasive Co., Tacony and Fraley Sts., Bridesburg, Philadelphia, Pa.

ACCUMULATORS, Hydraulic
American Steel Foundries, Elmes Engineering Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

How does YOUR PRESS check out?

STANDARD PRESS FEATURES (at no extra cost)	PRESS-RITE	YOUR PRESS
Uni-Cast Frame	✓	
Anti-Friction Roller Bearings in Flywheel	✓	
Four Point Engagement Sliding Clutch Key	✓	
Automatic Cam Operated Brake	✓	
Cam Operated Single Stroke Safety Mechanism	✓	
Built-In Tie Rods	✓	
Triple Ramway Lubrication	✓	
Bronze Bushed Main Bearings	✓	
Replaceable Die Shank Bushing	✓	
Airflex Friction Clutch (optional at extra cost)	✓	



PRESS-RITE
OPEN BACK—INCLINABLE
POWER PRESSES

No. 60 — 60 Tons
Air Clutch Equipped

COMPLETE LINE
Press-Rite Presses are available in a complete range of models and capacities from 5 to 85 tons.

FREE ▶
. . . this booklet containing complete detail and specifications on the Press-Rite line Just write on your business letterhead and ask for your copy of Bulletin P552.



Get ALL these important benefits in one press . . . increased production . . . longer die life . . . greater operator confidence . . . longer press life . . . safety of operation . . . lower maintainance costs . . . and scores of others.

Sales Service Machine Tool Co. SSMT
PRESS RITE PRESSES • SHAPE RITE SHAPERS • KELLER POWER HACK SAWS
2351 UNIVERSITY AVENUE • ST. PAUL 4, MINNESOTA

AIR HOISTS—See Hoists, Air.

AIR TOOLS—See Grinders, Pneumatic; Drills, Portable Pneumatic, Etc.

ALLOY STEELS
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York 1, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Union Drawn Steel Div., Republic Bldg., Cleveland, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., Carnegie-Illinois Steel Corp. Div., 436 7th Ave., Pittsburgh, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

ALLOY STEELS, High Temperature
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.

ALLOYS, Aluminum
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

ALLOYS, Non-Ferrous
American Brass Co., 25 Broadway, New York.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

ARBOR PRESSES
See Presses, Arbor

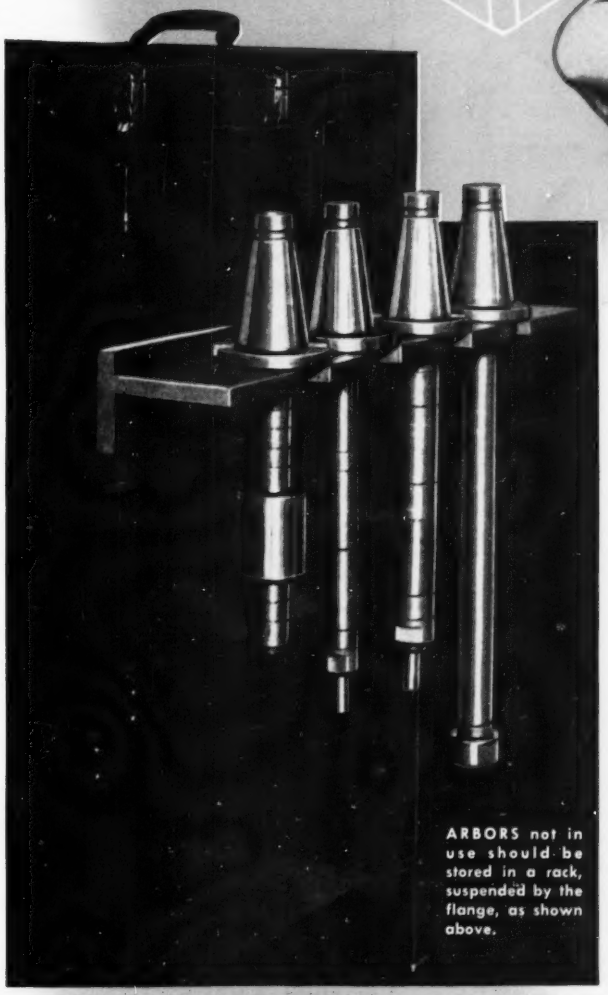
ARBORS AND MANDRELS
Beaver Tool & Engineering Corp. (Arbors, only), 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Gorton, George Mch. Co., 1110 W. 13th St., Racine, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.

(*Continued on page* 314)

For more information on products advertised, use Inquiry Card, page 247

That's Right, My Lad —PLAY SAFE!





ARBORS not in use should be stored in a rack, suspended by the flange, as shown above.

This young catcher has the right idea. He wears a mask behind the bat. He doesn't believe in taking any unnecessary chances.

Many a shop foreman . . . or superintendent, for that matter . . . could learn a lesson from this cautious youngster. For often a shop executive has to "take-it-on-the-chin" when vital production schedules are disrupted.

For example, when a milling machine arbor breaks down, production ceases instantly. Both machine and operator become idle, and their supervisor is in a dilemma . . . UNLESS a spare arbor is immediately available.

So play safe! Keep several spare arbors on hand for emergencies. Remember, arbors are classed as "perishable tools" and their cost today is relatively small.

Kempsmith Arbors in all popular sizes and types are regularly carried in stock. Every one is a precision-built tool, adaptable to ANY make of milling machine equipped with standardized spindle. Fill-in and mail coupon for copy of Kempsmith Arbor Bulletin No. 116.

THE KEMPSMITH MACHINE CO.
1821 S. 71st Street Milwaukee 14, Wis., U. S. A.

Arbors BY KEMPSMITH

Precision Built Milling Machines Since 1888

Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME ..... TITLE .....

FIRM ..... ADDRESS .....

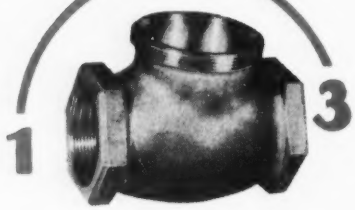
A 4746-1PC

Single set-up covering ALL finishing operations...

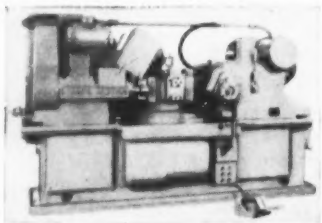
MEANS GREATER ACCURACY with GOSS DeLEEUW











AUTOMATIC CHUCKING MACHINES

One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & De Leeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & De Leeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.



Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW QUALITY PRODUCT-QUANTITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

BABBITT

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Ryerson, Jos. T., & Son, 2558 W. 16th St., Chicago 18, Ill.

BALANCING EQUIPMENT

Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Cosa Corp., 405 Lexington Ave., New York 17.
Gisholt Machine Co. (Static and Dynamic), 1245 E. Washington Ave., Madison 10, Wis.
Keller Tool Co., Grand Haven, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pope Machinery Corp., Haverhill, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Thor Power Tool Co., Aurora, Ill.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BALLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Kennametal, Inc., Latrobe, Pa.

BARS, Phosphor Bronze

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BARS, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., (Cold Drawn), Republic Bldg., Cleveland, Ohio.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.

BASES, Machinery Welded

Mahon, R. C., Co., 6565 E. 8 Mile Rd., Detroit 34, Mich.

BEARINGS, Babbitt

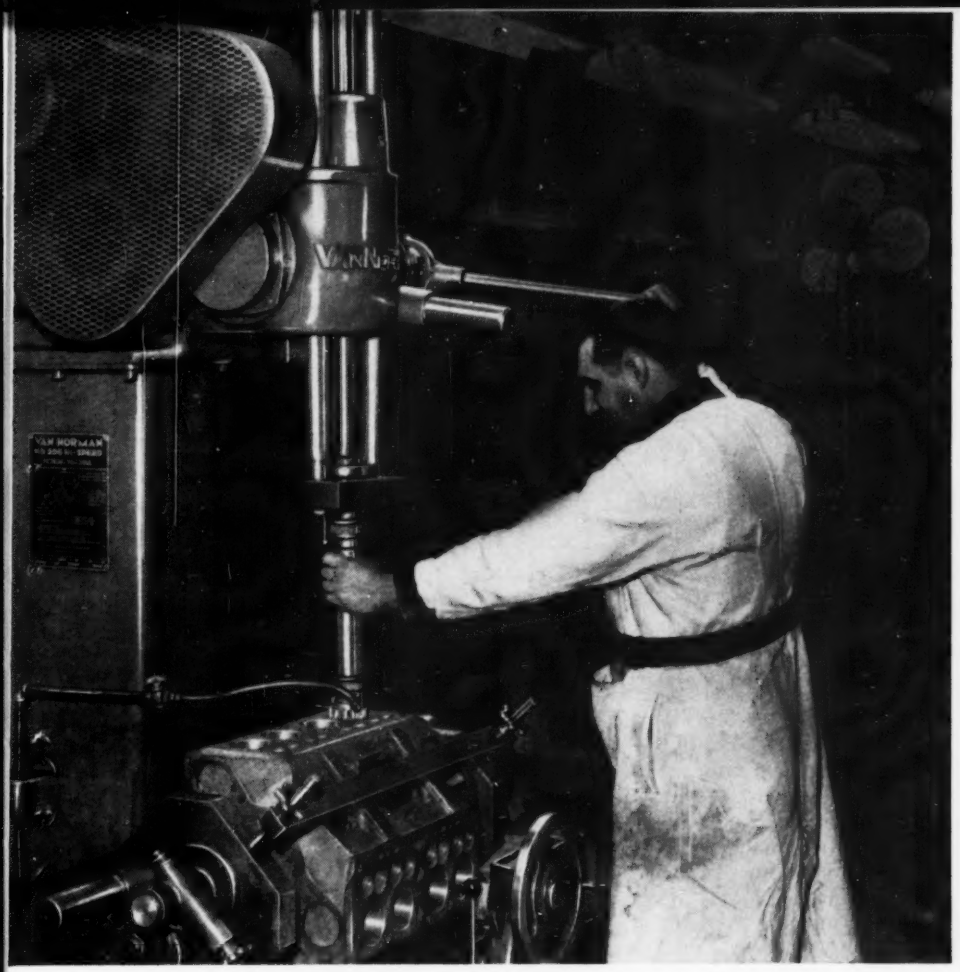
Bunting Brass & Bronze Co., Spencer and Carlton Ave., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Ball

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Torrington Co., Torrington, Conn.

(*Continued on page* 316)

For more information on products advertised, use Inquiry Card, page 247



Better honing results from start to finish with...

STANICUT
TRADE MARK
Cutting Oil

A midwest metalworking company—rebuilder of a popular automobile engine—had a cutting oil problem. On the honing operation, shown above, the finish obtained on engine cylinders did not measure up to the high quality desired by that firm. Various honing oils were tried without measurable improvements.

The problem was put to a Standard Oil cutting oil specialist. He recommended the use of STANICUT Oil No. 62 FC, a light-colored, light-bodied cutting oil that contains the correct proportion of extreme-pressure and friction-reducing ingredients. From every angle, STANICUT has proved ideal for the job. The desired finish has been obtained on the cylinders. Tool life has been greatly increased. Oil consumption has been reduced.

Whatever your machining operation, the Standard Oil cutting oil specialist serving your area of the Midwest has the cutting oil that will meet your needs. He has the experience and special training necessary to help you get better cutting oil results. How you can get his help easily and quickly is explained at the right. Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

What's YOUR Problem?



J. E. Weston, of Standard Oil's Kansas City office, is the lubrication specialist who helped this metalworking company solve a "finish" problem on the honing operation described at the left.

Like all of the many Standard lubrication specialists located throughout the Midwest, he has the experience and special training necessary to analyze his customer's needs. Like all of Standard's lubrication specialists, he is close at hand and therefore able to give his customer on-the-spot assistance.

You can reach the lubrication specialist serving your area of the Midwest by phoning your local Standard Oil office. He will be glad to discuss your operations and with no obligation to you. There may be savings for you in the benefits offered by such outstanding cutting oils as:

STANICOOL HD Soluble Oil — Because it contains additional compounding, this heavy-duty soluble oil possesses not only the cooling ability of an emulsion but also the ability to give better tool life and finer finishes than can be obtained with a conventional soluble oil.

STANOSTAMP Compounds — Here are three established products for stamping or heavy drawing operations of either low-carbon or alloy steels. Water can be added to these paste compounds to provide the most economical applications. STANOSTAMPS offer maximum protection for dies and work. These compounds can be removed readily in conventional washing equipment.

STANDARD OIL COMPANY STANDARD *(Indiana)*

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

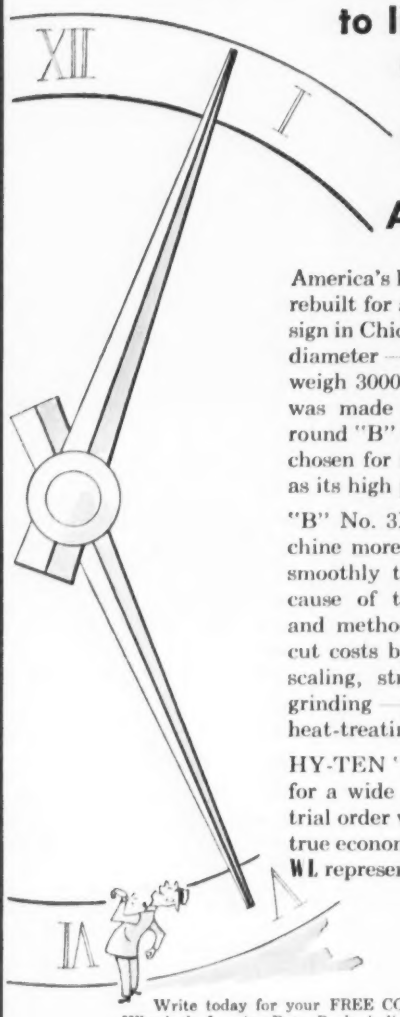
BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

it's the right time

to Investigate the Qualities of

HY-TEN

ALLOY STEEL



America's largest clock was recently rebuilt for a spectacular illuminated sign in Chicago. It measures 50 ft. in diameter — hands and movement weigh 3000 lbs. The new driveshaft was made from 6 ft. of 3½-inch round "B" No. 3X heat-treated bar, chosen for its machinability as well as its high physical properties.

"B" No. 3X heat-treated bars machine more readily and finish more smoothly than standard alloys because of their particular analysis and method of manufacture. They cut costs by eliminating distortion, scaling, straightening — and often grinding — as well as the cost of heat-treating finished parts.

HY-TEN "B" No. 3X bars are used for a wide range of applications. A trial order will convince you of their true economy. Just call your nearest **WL** representative.

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.



WHEELOCK, LOVEJOY & COMPANY, INC.

Warehouse Service

CAMBRIDGE • CLEVELAND
CHICAGO • HILLSIDE, N.J.
DETROIT • BUFFALO
CINCINNATI

In Canada
SANDERSON-NEWBOULD, LTD., MONTREAL

HY-TEN and AISI

138 Sidney St., Cambridge 39, Mass. and Cleveland • Chicago • Detroit Hillside, N. J. • Buffalo • Cincinnati

BEARINGS, Bronze and Special Alloy

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Johnson Bronze Co., New Castle, Pa.
Link-Belt Co., 2410 W. 18th St., Chicago 8, Ill.

BEARINGS, Lineshaft

Fafnir Bearing Co., New Britain, Conn.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Orange Roller Bearing Co., Inc., Orange, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

BEARINGS, Needle

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Orange Roller Bearing Co., Inc., Orange, N. J.
Torrington Co., Torrington, Conn.

BEARINGS, Roller

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Fafnir Bearing Co., New Britain, Conn.
Hyatt Bearings Div., Harrison, N. J.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Rollway Bearings Co., Inc., 541 Seymour St., Syracuse, N. Y.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Self-Lubricating (Oilless)

Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Tapered Roller

C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BEARINGS, Thrust

Aetna Ball & Roller Bearing Co., 4612 Schubert Ave., Chicago, Ill.
Ball & Roller Bearing Co., Danbury, Conn.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Fafnir Bearing Co., New Britain, Conn.
General Electric Co., Schenectady, N. Y.
Kaydon Engineering Corp., McCracken St., Muskegon, Mich.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Marlin-Rockwell Corp., 402 Chandler Bldg., Jamestown, N. Y.
Nice Ball Bearing Co., Nicetown, Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Orange Roller Bearing Co., Inc., Orange, N. J.
Timken Roller Bearing Co., Canton, Ohio.
Torrington Co., Torrington, Conn.

BELT SHIFTERS

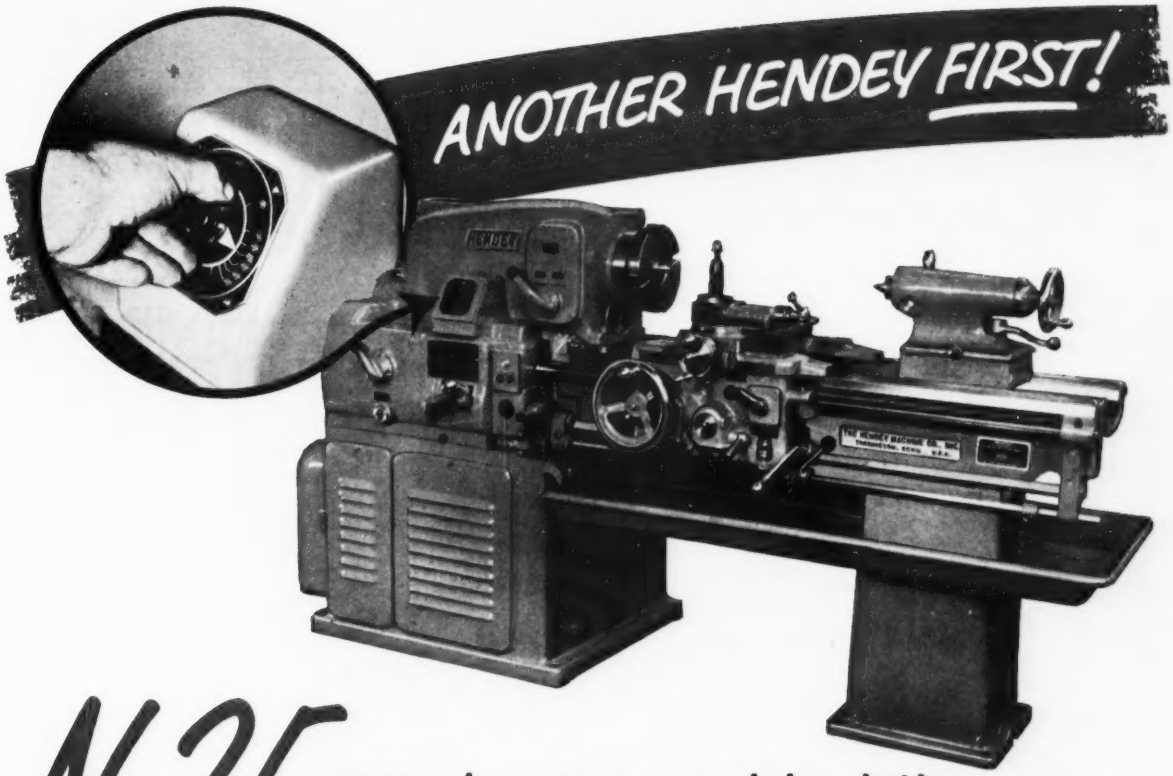
Standard Pressed Steel Co., Jenkintown, Pa.

BELTING, TRANSMISSION

Houghton, E. F. & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

(*Continued on page* 320)

For more information on products advertised, use Inquiry Card, page 247



No. 2E general purpose precision lathe WITH ELECTRONIC MOTOR CONTROL

Hendey, pioneer in "quality," introduces another *first* — a new 14″ precision general purpose lathe with infinitely variable spindle speed control to 1500 R.P.M. Because of this outstanding feature the No. 2E offers broad opportunities to increase efficiency and lower turning costs, with operator effort reduced to a minimum.

Effortless control by one convenient fingertip selector smoothly adjusts spindle speeds through the full range from 15 to 1500 R.P.M. Adjust under cut or pre-set to the most efficient speed . . . it's that simple. The Hendey proved electronic control of the drive motor takes over the effort . . . responds to the operator's every spindle speed requirement. Instantaneous electric dynamic spindle braking plus start, stop, and reverse are one-lever controlled at the headstock and apron.

Add to this . . . induction hardened and precision ground bedways . . . reverse to the lead screw . . . automatic lubrication . . . 48 feed and thread changes . . . sturdy V-type cross ribbed bed . . . convenient grouping of operating controls . . . plus traditional Hendey built-in quality and precision.

Write for detailed specifications.



the Hendey machine co., inc.
torrington, conn., u.s.a.
——precision machine tools——

HENDEY

distributors in principal cities

THESE 3 FREE-MACHINING ...COLD-FINISHED

LEADED NOW



MACHINES 45% FASTER THAN B1113

At last you can switch over to LA-LED lead-bearing, free-machining steel bars for additional applications. This faster machining LaSalle steel cuts your parts cost and also improves your product. And because it is an open-hearth steel, LaSalle LA-LED has the added qualities of ductility, fine finish, and satisfactory carburizing. It maintains close dimensional accuracy, and can be crimped, riveted, staked, and cold worked. Available in rounds $\frac{5}{16}$" through 3", and hexagons $\frac{5}{16}$" through $1\frac{1}{2}$".



La Salle STEEL COMPANY

Manufacturers of the Most Complete Line of Cold-Finished Carbon and Alloy Steel Bars in America!

STEEL BARS AVAILABLE!



ACTUALLY REPLACES BRASS!

MACHINES 80% FASTER THAN ORDINARY SCREW STOCKS

New!
LEADED ALLOYS
.20 Carbon—.40 Carbon

ALL THE PROPERTIES OF ALLOY BARS PLUS GREATER MACHINABILITY!

Now you can get both Leaded 8620 and Leaded 4140 cold finished steel bars. Being leaded, they machine one-third faster! Heat treating characteristics, hardenability, and mechanical properties are not appreciably affected by the addition of lead.

Here is the fastest machining steel ever commercially developed—Super LA-LED. Its exceptional machinability permits its use for those parts which previously could be machined economically only from brass. Since machine capacities so often limit the daily production of brass parts, you can now use Super LA-LED and obtain production approaching that of brass—and drastically cut the part cost.

Send for these Bulletins



LA SALLE STEEL COMPANY
1428 150th Street
Hammond, Indiana

Please send me the following La Salle Helpful Data Bulletins:

☐ LA-LED #9 ☐ Super LA-LED #12 ☐ LEADED ALLOYS #14

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____



HOW B. Jahn

PROGRESSIVE DIES SLASH ARCTIC BUCKLE COSTS!



Intricate dies by B. Jahn actually form and assemble 140 buckles—complete with "snap"—per minute!

The production of low cost arctic buckles represents another difficult — seemingly impossible — tooling bottleneck solved by B. Jahn design and engineering ingenuity. Not only was forming required, but permanent assembly as well — complete with spring clip locking feature incorporated into finished assembly.

DIE RIBBONS ILLUSTRATING DIRECTION OF FEED AND COMPLICATED TOOLING REQUIRED. 9 STATIONS ON EACH SIDE OF THIS PROGRESSIVE DIE TERMINATED IN A CUT-OFF AND ASSEMBLY STROKE.

The inevitable result — a progressive die — production proved by B. Jahn to deliver 6720 finished buckles per hour — all identical — each ready for assembly line use.

To guarantee the die's performance in customer's equipment to his complete satisfaction, more than 25,000 buckles were submitted for gauging and assembly line use before the die was certified "Production Proved" and shipped. Not only arctic buckles, but countless components from typewriter keys to carbine clips, cameras to loudspeakers can be mass produced IN LESS TIME, AT LESS COST, TO FINER FINISHES WITH B. JAHN PROGRESSIVE DIES.



SEND NOW FOR FACTUAL, PICTORIAL BROCHURE—"The Story of B. Jahn Production Proved Dies".

B. Jahn

THE B. JAHN MANUFACTURING COMPANY • NEW BRITAIN, CONNECTICUT

BENCHES, Work, and Bench Legs
Standard Pressed Steel Co., Jenkintown, Pa.

BENDING MACHINES, Angle Iron, Plate, Etc.
Consolidated Mch. Tool Corp., 565 Blossom Rd., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
O'Neil-Irwin Mfg. Co., Lake City, Minn.

BENDING MACHINES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 30 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Sta., Buffalo, N. Y.
Morgan Engineering Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

BENDING MACHINES, Pipe
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York Pa.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Pines Engineering Co., Inc., Aurora, Ill. (Hydraulic)
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BLAST CLEANING EQUIPMENT
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pangborn Corp., Hagerstown, Md.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

BLOWERS
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

BLUING LAYOUT
Dykem Co., 2303 P. N. 11th St., St. Louis 6, Mo.

BOILER TUBES
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Steel and Tubes Div., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

BOLT AND NUT MACHINERY
Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
New Britain Machine Co., New Britain-Gridley Mch. Div., New Britain, Conn.

BOLTS AND NUTS
Allmetal Screw Products Co., Inc., 621 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Ottemiller, W. H., & Co., York, Pa.
Republic Steel Corp., Bolt & Nut Div., Republic Bldg., Cleveland 1, Ohio.
Russell, Burdsall & Ward Bolt & Nut Co., 100 Midland Ave., Port Chester, N. Y.

BOLTS, T-Slot
O. K. Tool Co., Milford, N. H.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.

(*Continued on page 322*)

For more information on products advertised, use Inquiry Card, page 247

ANACONDA® METALS AT WORK

Copper "package" for the coldest products on earth



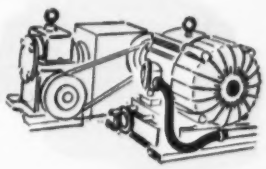
This container for storing and transporting liquefied helium (—452 F.) or hydrogen (—421 F.) is made by Superior Air Products Co. of Newark, N. J. The secret of keeping heat out to reduce evaporation is four concentric copper spheres separated by a high-vacuum space, a nitrogen protecting bath, and a second high-vacuum space — the entire unit enclosed in a stainless steel casing. Copper contributes ductility and malleability for spinning into hemispheres, unexcelled soldering properties for joining into spheres, and a mirror finish to reduce radiation losses. Need we tell you that it's made of ANACONDA Copper?

This "iron horse" runs on brass



The "High Iron" we're referring to is the HOBBYLINE HO-GAGE model railroad track which John A. English & Co. of Morrisville, Pa., makes of FORMBRITE** strip. This fine-grain, yet ductile forming brass produces a track so strong and stiff it will support an adult's weight. In products where finishing costs count, users find that FORMBRITE usually needs only a color buff to produce a high finish.

Flexible conduit enjoys a splash in a bath



The real trick is to make an electrical conduit that's flexible *and* liquid-tight *and* approved by Underwriters' Laboratories for such applications. SEALTITE* Type UA does all three. Made with a tough synthetic jacket extruded over a flexible steel core, it's shown here protecting wiring to motor in an auto laundry. It ignores not only splashing, but also oil and grease, and resists abrasion. Want more facts?

We put an end to "the bends"



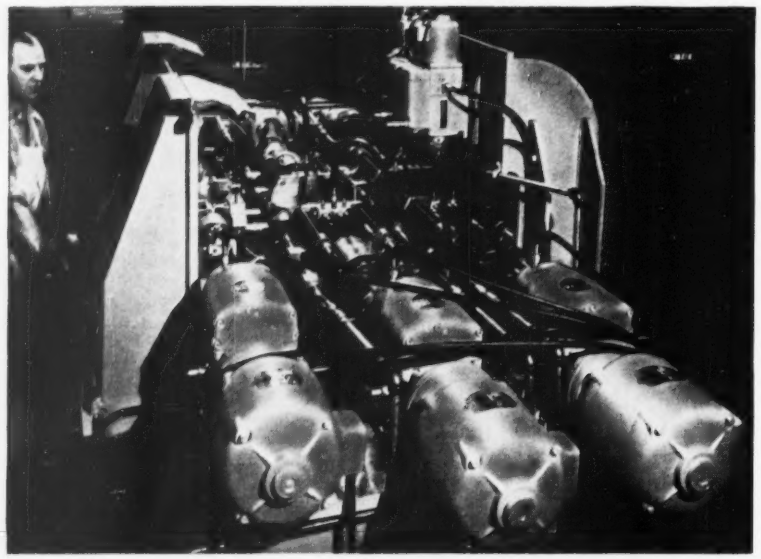
We don't mean the kind deep-sea divers suffer from, but the kind heating contractors had to put up with when they installed radiant panel heating systems. Heretofore, many contractors formed the panel grids on the job by hand-bending them from coils of tubing—a time-consuming, laborious, back-breaking job. Now PG's** have ended all that. They are the new, compactly packaged, accurately *preformed* ANACONDA Copper Tube Panel Grids . . . from the handy carton to installation is only a matter of minutes. PG's are another ANACONDA first.

A service for you

Our Technical Department has a range of experience that covers the entire field of copper and copper-alloy applications in industry. If you have a problem of metal selection, we are at your service. *The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.*

*Trademark
**Reg. U.S. Pat. Off. 5393

ANACONDA® *the name to remember in* **COPPER — BRASS — BRONZE**



Machine Details
Dimensions: 10¾' long, 6½' wide, 7' high, weight about 16,000 lbs. 8 Delta drill units: 6 Model 19-400, 2 Model 19-150. 5 drill units equipped with multiple-spindle drill heads. Total HP—13.



Control Panel
Selector switches make possible any combination of 3 positions, 8 stations—a universal machine. Operator presses a starting button, sequence of operations is automatic; machine stops automatically when work is finished. 3000 feet of wiring between panel and machine.

From 25 minutes to 2 minutes

—that's the time saved by A.B. DICK CO.

with 8 DELTA AIR-POWERED HYDRAULIC DRILL UNITS

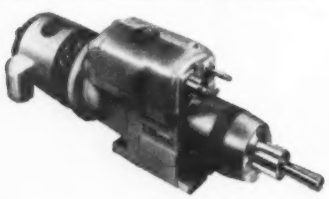
When conventional tools required 25 minutes to complete 9 holes in a spirit-duplicator cylinder, A. B. Dick engineers built their own special horizontal drilling machine, using 8 Delta air powered hydraulic drill units, and now do the job in less than two minutes.

Their new machine drills, spot faces and reams 9 holes in aluminum cylinders—needs but a single operator, has automatic remote control.

Operation of this 3-position, 8-station machine consists of loading and pressing the starting button. The Delta drill units operate in four banks, in automatically controlled sequence of drilling, spot facing, milling and reaming. When the cycle is completed, the finished piece returns to original position and the machine stops. It is universal—handles any piece up to 12" diameter and 24" length.

"This machine is so fast and so accurate," says Edward Brenn, design engineer, "that 3 or 4 days use per month is ample to keep up with production demand. The operator is free for other duties. We just didn't have the equipment to do this job economically—so we built the machine ourselves."

Three Delta air powered hydraulic drill unit models are now available to meet your specific requirements—1½", 4" or 6" stroke, No. 80 to 1" diameter drill. See your authorized Delta drill unit dealer—write for new catalog.



DELTA QUALITY MACHINE TOOLS
Another Product of **Rockwell**

Delta Drill Unit Division
Rockwell Manufacturing Company
614M N. Lexington Avenue,
Pittsburgh 8, Pa.

☐ Please send catalog AD-723.
☐ Send name of nearest authorized Delta drill unit dealer.

Name _____
Position _____
Company _____
Address _____
City _____ Zone ___ State _____

DELTA MACHINE TOOLS

DELTA QUALITY MAKES THE DIFFERENCE

BOOKS, Technical
Industrial Press, 148 Lafayette St., New York 13, N. Y.
Lincoln Electric Co., 22801 St. Clair Ave., Cleveland, Ohio.

BORING AND DRILLING MACHINES
Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Canedy-Otto Div. Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING AND TURNING MILLS, Vertical
American Steel Foundries King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pan American Export Corp., 140-53rd St., Brooklyn 32, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

BORING BARS
Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Homestrand Inc., Larchmont, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

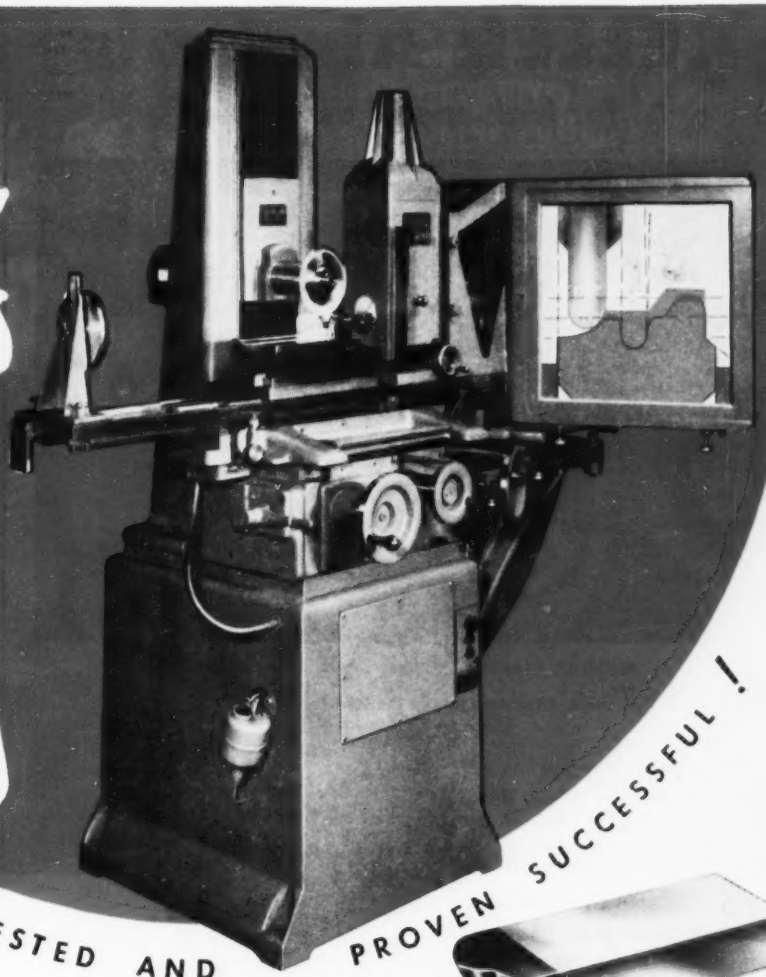
BORING, DRILLING AND MILLING MACHINES, Horizontal
(Floor, Planer or Table Types)
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17.
Espen-Lucas Machine Works, Front St. and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Lucas Mch. Tool Div., New Britain Mch. Co., 12302 Kirby Ave., Cleveland 8, Ohio.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

(*Continued on page* 324)

For more information on products advertised, use Inquiry Card, page 247

Positive Results with VISUAL GRIND

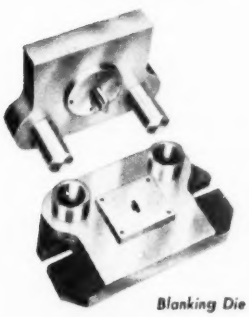
TRADE MARK



TESTED AND PROVEN SUCCESSFUL !



Progressive Die

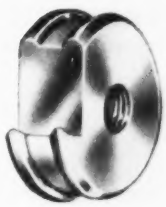


Blanking Die

Here is precision contour grinding at its best. Steel and tungsten carbide form tools, die sections, templates and related items are efficiently processed in dependable, economical fashion. Our basic magnetic chuck work-holder affords positive positioning yet with flexibility for cam, circular and index grinding with the proper fixtures. Workpiece quality is controlled visually at all stages, either while using pre-dressed grinding wheels or when generating the required contour by means of successive, controlled movements. Durable construction around precision optics insures rigidity and long life.

Ask for Bulletin "M-12"

Flat Form Tool



Circular Form Tool



Dovetail Tool

VISUAL GRIND

THE CLEVELAND GRINDING MACHINE COMPANY

1643 EDDY ROAD • CLEVELAND 12, OHIO

New Possibilities in Optical Grinding

KELLER Air Tools

for high speed assembly



ANOTHER EXAMPLE OF

KELLER *Air Tools engineered to industry*

Wherever parts are assembled with screws, nuts, bolts or rivets, the use of Keller Tools speeds up production, reduces costs, and makes work easier.

For example, in assembling record players (shown above), changing to Keller Air Tools made the work easier and faster, and substantially reduced production costs.



FACTS IN BRIEF

ABOUT KELLER PNEUMATIC SCREW DRIVERS

Weigh less

Consume less air

Need fewer "back-up" parts in the tool room

Interchangeable parts

Reduce operator fatigue

Clutches, socket drivers, 45° and 90° attachments for every purpose

Wide variety of handles, gearings, torques, speeds



Send for

FREE 36-Page Booklet

for more information and interesting ideas on air tool application

Keller Tool Company, Grand Haven, Mich.

Please send me a free copy of your booklet on Pneumatic Screw Driving and Nut Setting Tools

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

BORING HEADS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Mummert-Dixon Co., Hanover, Pa.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BORING MACHINES

Chandler Tool Co., 514 Ohio Ave., Muncie, Ind.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Simplex Machine Tool Corp., 4528 W. Mitchell St., Milwaukee, Wis.

BORING MACHINES, Jig

American Sip Corp., 100 E. 42nd St., New York 17, N. Y.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kearney & Trecker Corp., Milwaukee, Wis.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St. New York 12, N. Y.

BORING TOOLS

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit, Mich.
Giddings & Lewis Mch. Tool Co., Fond du Lac, Wis.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lovejoy Tool Co., Inc., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.

(*Continued on page* 326)

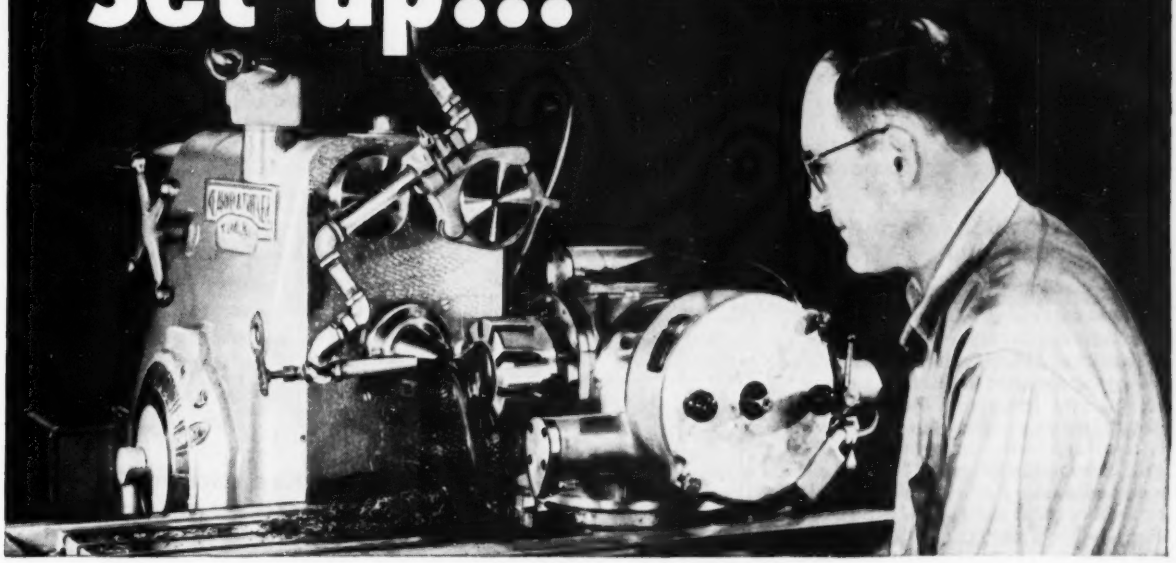
For more information on products advertised, use Inquiry Card, page 247

What a set-up...



Special Machinery Division

Builders of Precision and Production Machine Tools Since 1898.



for the customer... it put a one-at-a-time indexing job on a production basis!

for the operator... only one motion controls entire indexing and milling operation!

THIS Universal Automatic Indexing Attachment, used in conjunction with the automatic cycle table movement on a Kearney & Trecker milling machine, eliminated a tedious dividing head job. A large midwest machine tool builder found this setup ideal for milling slots in face-milling cutter bodies.

CYCLE TIME CONSIDERABLY REDUCED . . . after each cut the table automatically retracts just enough to clear the cutter . . . attachment indexes automatically and next cut begins.

NOTCH PLATES CONTROL ACTUAL INDEXING . . . up to 24 divisions possible . . . plates changed in a matter of seconds . . . can be indexed two ways, automatically and manually.

ANY PRACTICAL ANGLE OBTAINABLE . . . work-holding spindle housing can be swung 15° below horizontal and 15° beyond vertical (total 120° tilt). It swivels 140° about its vertical axis.

Request additional information on this versatile attachment.



Capacity . . . Experience . . . Performance

Upon completion of this $5,200,000 expansion of our Special Machinery Division, we offer you (1) unmatched facilities, (2) experience based upon more than 50 years in the design and production of special machinery, and (3) performance, best recommended by our outstanding record of successfully solving many hundreds of unusual machining problems.



For complete details on this attachment . . . ask for *Data Sheet No. 1008*. Free booklet describing the facilities of the Special Machinery Division is also yours for the asking. WRITE TODAY TO SPECIAL MACHINERY DIVISION, KEARNEY & TRECKER CORP., 6784 W. NATIONAL AVE., MILWAUKEE 14, WISCONSIN.

KEARNEY & TRECKER CORP. · *Special Machinery Division*

MILWAUKEE 14, WIS., U. S. A.

How to Save on STAMPINGS

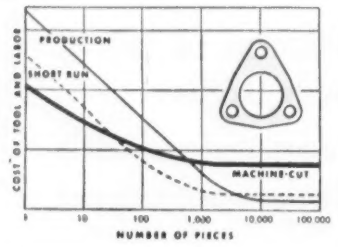
A COST-SAVING, VERSATILE APPROACH TO THEIR MANUFACTURE

Possibly you've always thought that a quick look at the quantity involved decides how a stamping shall be made. Sometimes it is done that way but it isn't the sure way to lowest costs.

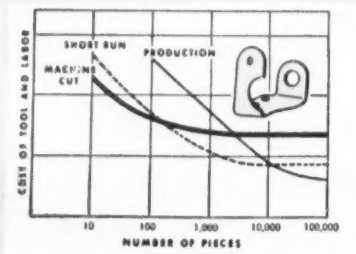
A more scientific approach by the STAMPINGS DIVISION of the Laminated Shim Company in Glenbrook, Connecticut frowns on the term "short run stamping." There is what is known as the short run *method* but there is no definite dividing point between short run and production quantities. Contour, tolerances, material, many other items all affect the manufacturing method when costs are being carefully figured.

NO ONE METHOD IS ALWAYS CHEAPEST; THREE ARE NEEDED

Machine-Cut Method: The STAMPINGS DIVISION goes one step further than Short Run and Production Methods. The Machine-Cut Method, though not strictly a stamping operation is a valuable addition to stamping procedure. Custom built slitters, cutters, saws and files use experience-gained techniques to fashion the smaller quantities of parts. No dies are made; only stock punches are used. Obviously labor cost is understandably high but there is no tool charge.



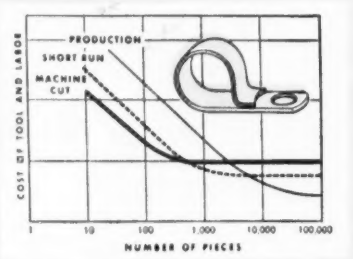
Short Run Method: As quantities increase (and depending upon the complications of contour, material, etc.) the economy of a temporary blanking die must be considered to eliminate the labor expense of machine-cutting. When this point is reached, manufacture is by the Short Run Method and the blanking is supplemented by other bench press operations. Here labor cost is at a medium level but a modest tool charge is incurred.



Production Method: As quantities increase the Production Method using standard dies with high speed automatic presses becomes more attractive. A relatively high tool charge can then be amortized over a great number of parts. Labor charge is negligible.

The Production Method as developed by the STAMPINGS DIVISION is offering unusual cost saving possibilities because of the new low-cost, full service Hecht-type die developed by the company for certain applications.

It is interesting to note that sometimes a very small quantity of parts would require a standard die because of complications or close tolerances or tough materials involved. Thus occasionally a very small quantity goes into the production classification.



LOWEST COST IS ASSURED WHEN SUPPLIER HAS ALL THREE METHODS

The illustrations show typical stamped parts along with relative costs and breaking points for each of the three manufacturing methods. Unless a supplier can offer all three, his costs cannot always be low. For a given quantity, only *one* method can be most economical.

ONE OR ONE MILLION PARTS FROM SAME SUPPLIER

An important corollary to the above is that an experimental part in small quantities can be handled by the same supplier when full production quantities are needed.

Further, it is important that a supplier be fully informed, if possible, on later or total requirements for a given part. As the charts point out, such information will affect manufacturing method and make possible cost reductions.

FURTHER INFORMATION AVAILABLE

An illustrated 12 page brochure describing in greater detail the methods mentioned above is available on request to the

STAMPINGS DIVISION
Laminated Shim Company, Inc.
3912 Union Street, Glenbrook, Conn.

Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engineering Co., Frankenmuth 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

BRAKES, Press and Bending

Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Road, S. W., Canton, Ohio.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Columbia Machinery & Engrg. Corp., Hamilton 1, O.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Peck, Stow & Wilcox Co., Southington, Conn.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BROACHES

American Broach & Mch. Co., Ann Arbor, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Detroit Broach Co., 20201 Sherwood Ave., Detroit, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BROACHING MACHINES

American Broach & Mch. Co., Ann Arbor, Mich.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Foote-Burt Co., 130 St. Clair Ave., Cleveland 8, Ohio.
Lapointe Mch. Tl. Co., Tower St., Hudson, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

BRONZE

American Brass Co., Waterbury 20, Conn.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Johnson Bronze Co., New Castle, Pa.

BRUSHES, Industrial, Wire Wheel, Etc.

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUFFERS

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md. (Portable Elec.).
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

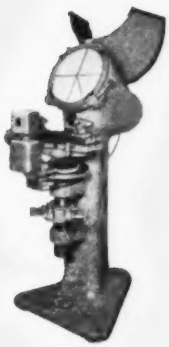
BULLDOZERS

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Atrax Co., Newington, Conn.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.

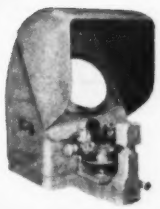
(*Continued on page* 330)

11 MODELS

3 SCREEN SIZES



Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models



Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

JONES & LAMSON OPTICAL COMPARATORS

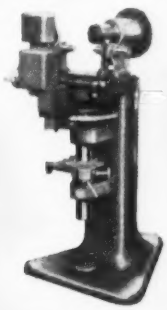
The Essence of Quality Control

Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

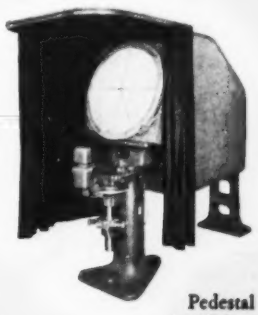
- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline – and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct – *without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.



Vertical Type
14" Diam. Screen



Direct
Projection
Type



Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON

JONES & LAMSON MACHINE COMPANY
512 Clinton St., Springfield, Vt., U.S.A.

Machine Tool Craftsmen Since 1835

J&L COMPARATOR DIV.
Dept. 710



Jones & Lamson Machine Company
512 Clinton Street, Dept. 710
Springfield, Vermont, U. S. A.
Please send Comparator Catalog No. 402.

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____

For more information on products advertised, use Inquiry Card, page 247

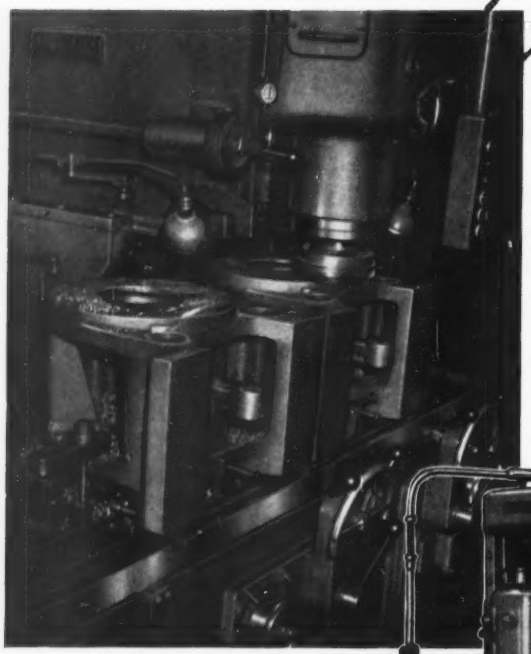


PRODUCE MORE . . . .

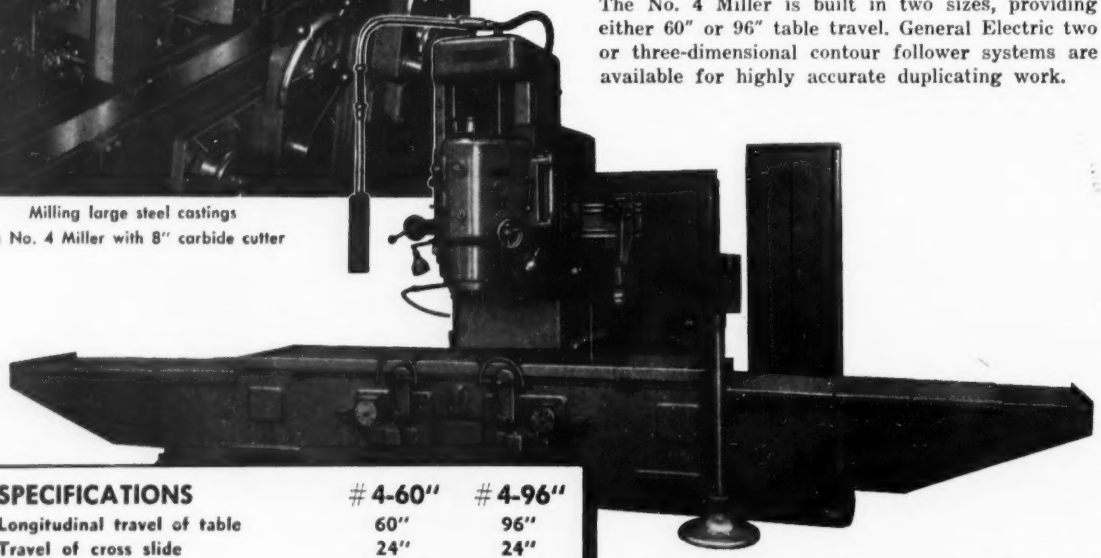
with REED-PRENTICE

The Reed-Prentice No. 4 Vertical Miller easily handles heavy-duty milling operations like the job shown at left. Ruggedly constructed for rigidity and accuracy, this machine features infinitely variable electronic feed drive for table, cross slide and vertical slide.

The No. 4 Miller is built in two sizes, providing either 60" or 96" table travel. General Electric two or three-dimensional contour follower systems are available for highly accurate duplicating work.



Milling large steel castings on No. 4 Miller with 8" carbide cutter



Reed-Prentice 96" No. 4 "Electronic" Miller with two-dimensional General Electric contour follower unit

SPECIFICATIONS	#4-60"	#4-96"
Longitudinal travel of table	60"	96"
Travel of cross slide	24"	24"
Table working surface	24 x 96"	24 x 132"
Feed range	½ to 25" per minute	
Spindle speeds: 20 HP motor	45-1800 RPM	
25 or 30 HP motor	90-1800 RPM	

BRANCH OFFICES

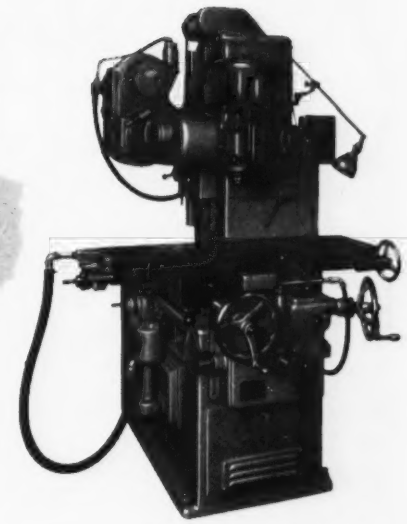
75 West St., New York 6, N. Y.
1213 West 3rd St., Cleveland 13, Ohio
4001 N. Elston Ave., Chicago 18, Illinois
2842 W. Grand Blvd., Detroit 2, Michigan

MACHINE TOOL REPRESENTATIVES

Philadelphia . . . Calco Machinery Co.
Buffalo . J. L. Osgood Machinery Corp.
Detroit . . . . . DoAll Detroit Co.
Grand Rapids . DoAll Grand Rapids Co.
Chicago . . . . . DoAll Mid-West Co.
Milwaukee . . . . DoAll Wisconsin Co.
Minneapolis . . . . Chas. W. Stone Co.
Houston . Preston Machine Tool Sales Co.
San Francisco . . Montague-Harris Co.
Los Angeles . . . . King Machinery Co.



MACHINE TOOLS

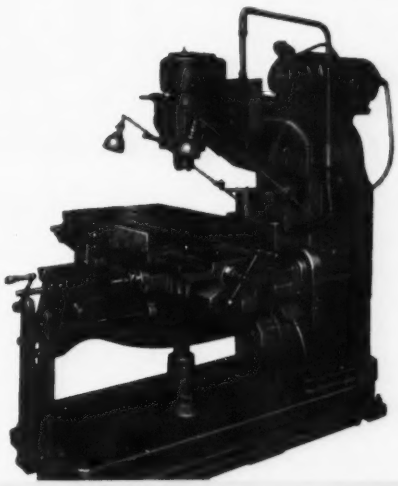


Universal Head 12V Vertical Miller

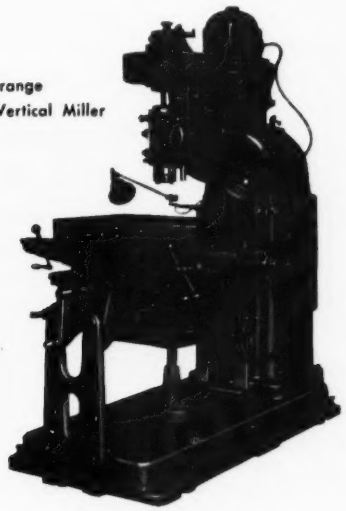
Reed-Prentice Machine Tools are profitable investments. Their versatility makes them equally valuable in toolroom or production work.

Model 22V and 22VS Vertical Millers provide a large 32 x 22" table and 30" throat depth. The 12V "Electronic" Miller has universal head adjustment, 46 x 12" table and can be supplied with electronic duplicating unit.

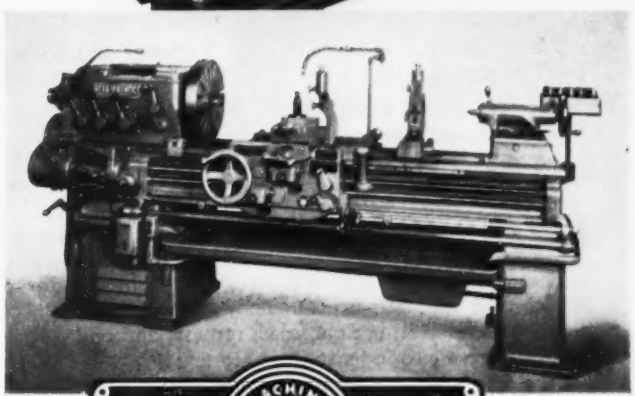
Reed-Prentice 14" and 16" Engine and Toolroom Lathes offer optional high spindle speeds to 1200 RPM for faster turning operations. Heavy-duty 20" Engine Lathe has 21½" swing over ways and 54" standard center distance.



Universal Head
22VS Vertical Miller



Wide-range
22V Vertical Miller



16" Toolroom
Lathe

REED-PRENTICE CORP.
MACHINE TOOLS
WORCESTER MASS. U.S.A.

MAIN OFFICE 677 Cambridge St., Worcester 4, Mass.

MANUFACTURERS OF LATHES, MILLERS, DIE CASTING AND PLASTIC INJECTION MOLDING MACHINES

ACCO products

WILSON "Rockwell"* Hardness Testers

NOW FOR ONLY

$550

(less accessories, F. O. B. Bridgeport)

you can get this

J-MODEL WILSON "Rockwell"



The Best...Costs Less...to Use

• When you use WILSON "*Rockwell*" Hardness Testers to check your products during various stages of manufacture, you will *be sure*. You will prevent costly complaints from your customers. The long experience of WILSON'S Standardizing Laboratory engineers is your assurance of top quality and accuracy in the "*Rockwell*" Testers you buy.

Six Important Features

1 Totally enclosed, dirt and dust-proof "Zerominder" dial gauge
2 Gripsel clamp screw for quick change and proper seating of penetrator
3 All controls grouped conveniently
4 Enclosed, easy-to-reach variable speed dash pot
5 Stainless steel elevating screw
6 Standardized weights

WILSON Makes a Complete Line

There are two types of WILSON "*Rockwell*" Hardness Testers . . . Regular and Superficial. They come in many styles with accessories for testing flats, rods, rounds, and odd shapes. For micro-indentation hardness testing, there is the WILSON TUKON.

Write for information and let us make recommendations

*Trade Mark Registered

ACCO

WILSON MECHANICAL INSTRUMENT DIVISION
AMERICAN CHAIN & CABLE

230-D Park Avenue, New York 17, N. Y.

WILSON "ROCKWELL" and TUKON Hardness Testers

Chambersburg Engrg. Co., Chambersburg, Pa.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

BURS

See Files and Burs, Rotary

BUSHINGS, Brass, Bronze, Carbide, Etc.

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Johnson Bronze Co., New Castle, Pa.
Kennametal, Inc., Latrobe, Pa.

BUSHINGS, Hardened

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
U. S. Steel Co., Inc., 436 7th Ave., Ptitsburgh, Pa.
U. S. Tool Co., Inc., 255 N. 18th St., Ampere, N. J.

BUSHINGS, Jig

Colonial Bushings, Inc., 31780 Groesbeck Hwy., Fraser, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Universal Engrg. Co., Frankenmuth, Mich.

CABINETS, Tool

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

CALIPERS

Ames, B. C., & Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

CAM CUTTING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CAM MILLING AND GRINDING MACHINES

Hirschmann, Carl, Co., 30 Park Ave., Manhassett, N. Y.
Landis Tool Co., Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rowbottom Machine Co., Waterbury, Conn.

CAMS

Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Kux Mch. Co., 3930-44 W. Harrison St., Chicago, Ill.
Rowbottom Machine Co., Waterbury, Conn.

CARBIDES, TANTALUM, TITANIUM AND TUNGSTEN

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wesson Metal Corp., Lexington, Ky.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(*Continued on page 334*)

For more information on products advertised, use Inquiry Card, page 247

WHAT DOES FIRTH STERLING OFFER YOU?

(ANSWER NUMBER 2)

ONE SOURCE FOR ALL TOOLING NEEDS

THE *RIGHT* STEEL *OR* CARBIDE . . . THE *EXACT* METALLURGICAL COMBINATION NEEDED TO DO YOUR JOB BEST . . . FROM A SINGLE MANUFACTURING SOURCE

The next time you have a difficult tooling problem we invite you to call in a Firth Sterling man.

He may be called a "tooling specialist" or a "sales engineer" . . . but anyhow he's just a fellow who understands the *cutting*, *shaping* and *forming* of metals like nobody's business. He *may* be a graduate engineer, or he may have learned the hard way on a milling machine, draw bench or press, but he *knows* the score.

He can give you an unbiased recommendation . . . because he has approximately 100 different grades of Firth Sterling high speed steels, and tool and die steels to choose from *and* a dozen grades of tungsten carbide in everything from die nibs to a virtually unlimited variety of standard and special carbide cutting tools and tips.

All this is backed by 64 years of leadership in the development and production of special purpose steels, and 24 years of pioneering in carbide and "powder metallurgy" applications.

It makes sense, that a company which engages in *all* phases of tooling metallurgy will serve your interests best.

Remember, Firth Sterling *is* a single, dependable source for complete shop tooling.

Firth Sterling Stands for Metallurgical Achievement—Past, Present, Future

I-2

C.H.Q. DIE STEEL

hangs up... **ANOTHER COLD HEADING RECORD IN COMPARATIVE TESTS!**

A nationally known fastener manufacturer* recently made comparative tests of solid steel cold heading dies, under carefully controlled conditions, producing ⅝" square head machine bolts from 1020 steel on a Waterbury Farrel double stroke automatic.

Firth Sterling C.H.Q. came off with top honors and the highest production ever



C. H. Q. solid die after 192,000 run.

obtained by this manufacturer from any steel die . . . 192,045 both ends. (78,860 one end, 59 Rockwell C; 113,185 other end, 61 Rockwell C). Standard competitive carbon steel dies produced only 50,000—60,000 both ends and ultimately failed by cracking axially. The C.H.Q. die wore oversize but longitudinally etched



Longitudinally etched section reveals no cracks.

section revealed not even a hair line crack.

Ask for technical literature on C.H.Q.—or a Firth Sterling representative will discuss your die problems. His recommendations are unbiased . . . we make and sell *both* steel *and* carbide for every tooling need.

*(name on request)

P-10

Firth Sterling

— INC. —

GENERAL OFFICES: 3113 FORBES ST., PITTSBURGH 30, PA.

OFFICES* AND WAREHOUSES: BIRMINGHAM* CHICAGO CLEVELAND DAYTON* DETROIT HARTFORD HOUSTON* LOS ANGELES NEW YORK* PHILADELPHIA* PITTSBURGH* WASHINGTON*

PRODUCTS OF FIRTH STERLING METALLURGY

High Speed Steels
Tool & Die Steels
Stainless Specialties
High Temperature Alloys
Sintered Tungsten Carbides
Firth Heavy Metal
Chromium Carbides
High Temperature Cermets

For more information on products advertised, use Inquiry Card, page 247


Hobbing
Transmission Gears
350% Faster
1458 Ultra Speed Gear Hobber
GEAR CUTTING
GEAR FINISHING
Complete Equipment
For Gear Production
GEAR LAPPING
GEAR CHECKING



.....headline in
Production Engineering
& Management
January, 1953

"FORD Hobs Gears 350% Faster"

We've checked on it and the editors of PRODUCTION ENGINEERING & MANAGEMENT are right. At Ford Motor Company 3⅛" diameter, 9-pitch, 1⅝" face width transmission gears are being hobbed at a production rate 350% greater per spindle than compared with multiple spindle machines. To do this Ford uses one of the new Michigan Ultra-Speed gear hobbers equipped with double thread accurate unground Michigan hobs. Gears are hobbed two at a time, 58 seconds per pair.

Despite the high output rate, 225 gears are produced per sharpening of the hob. Among the reasons given are that "the machine is of rugged, compact construction, simplified in design, with few gears for the index and main drive and . . . with a maximum spindle speed of 1000 rpm."

Of interest is that better control of surface finish is obtained by easier subsequent shaving. Loading and unloading time is kept to a minimum by hydraulically-actuated expanding arbors. Vibration has been practically eliminated by providing maximum rigidity plus a flywheel to dampen torsional vibration.

For further details, write for Bulletin #1458-52.

GEAR PRODUCTION HEADQUARTERS

MICHIGAN TOOL COMPANY

from blank to finished gear

7171 E. McNICHOLS RD. • DETROIT 12, MICHIGAN, U. S. A.

We're Glad...

TO BE KNOWN BY THE COMPANY WE KEEP!

Used Laminum Shims for 15 years

GENERAL ELECTRIC
Used Laminum Shims for 20 years

LE ROI
Used Laminum Shims for 29 years

THE Lorain
Used Laminum shims for 25 years

ALDRICH
Used Laminum Shims for 29 years

Waukesha MOTOR
Used Laminum shims for 37 years

ROAD ADAMS MACHINERY
Used Laminum Shims for 20 years

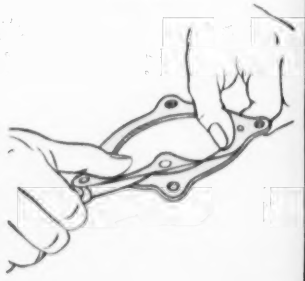
WORTHINGTON
Used Laminum shims for 24 years

Ingersoll-Rand
Used Laminum shims for 25 years

York
Used Laminum shims for 20 years

LANDIS TOOL
Used Laminum Shims for 20 years

Send for free catalog
No obligation.



Here are a few of our older customers — who with hundreds of other companies use the foolproof, accurate Laminated Shim method to gain exact fit and save time in assembly... and at the same time gain a "built-in" adjustment for service wear. Get the full story — find out why so many design leaders specify Laminated Shims!

SHIM HEADQUARTERS SINCE 1913

Check our Stampings Division — for short run or high production stampings.

LAMINATED SHIM COMPANY, INC.

3912 UNION STREET • GLENBROOK, CONNECTICUT

CASEHARDENING FURNACES
See Furnaces, Heat-Treating

CASTINGS, Aluminum, Brass, Bronze, Magnesium, Etc.
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
Bethlehem Steel Co. (Brass and Bronze only), Bethlehem, Pa.
Bunting Brass & Bronze Co., Spencer and Carlton Aves., Toledo, Ohio.

CASTINGS, Die
Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.
American Brass Co., Waterbury 20, Conn.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Madison-Kipp Corp., Madison, Wis.

CASTINGS, IRON
Bethlehem Steel Co., Bethlehem, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Chambersburg Engineering Co., Chambersburg, Pa.
Hansell-Elcock Co., 485 W. 23rd Place, Chicago 16, Ill.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.

CASTINGS, Steel, Alloys, Etc.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Lebanon Steel Foundry, Dept. J, Lebanon, Pa.
Link-Belt Co., 180 W. Duncannon Ave., Philadelphia 20, Pa.
U. S. Steel Corp., Columbia Steel Co., Div., 436 7th Ave., Pittsburgh, Pa.

CEMENT, Disc Grinding Wheel
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

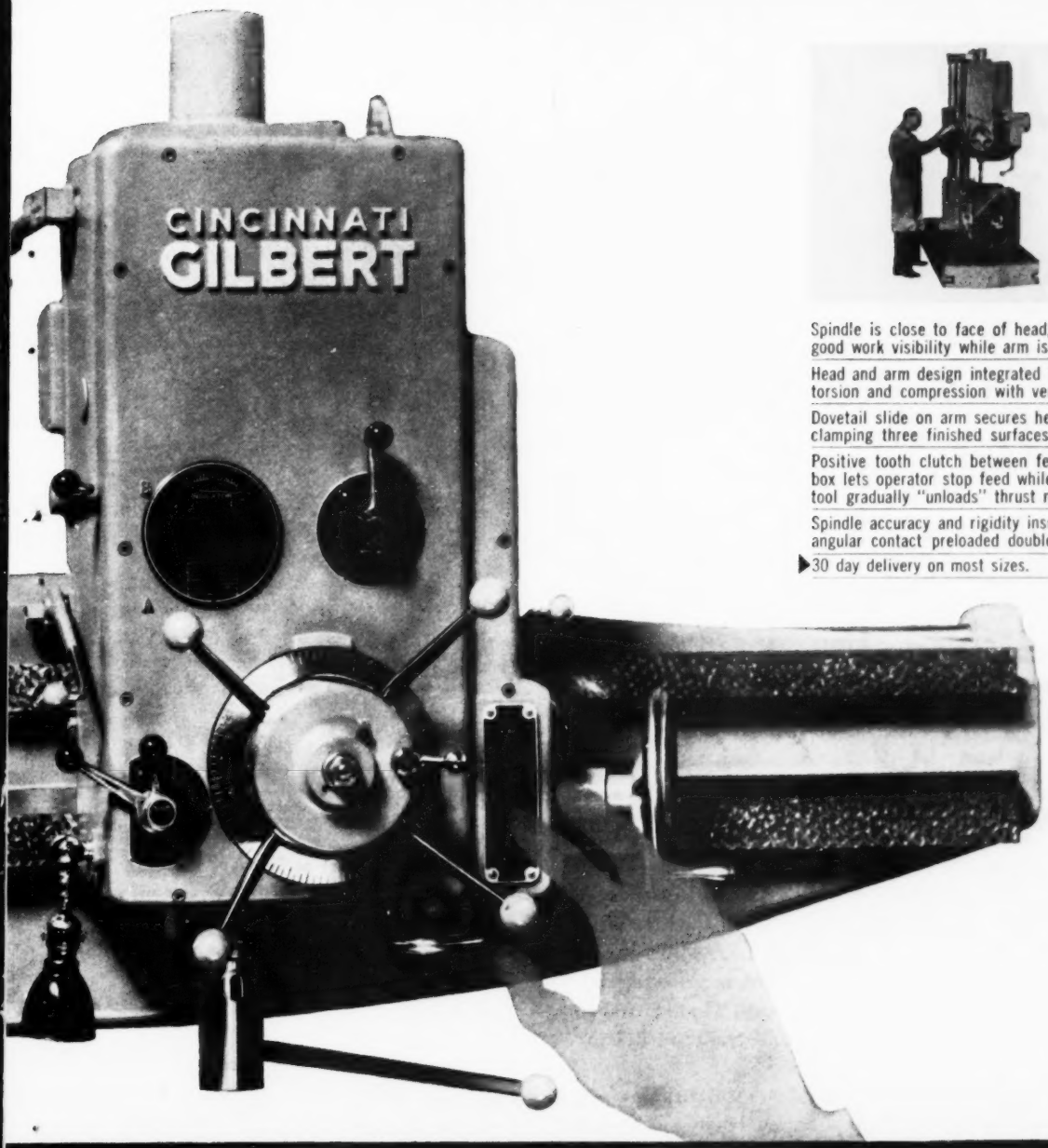
CENTERING MACHINES
Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Jones & Lamson Mch. Co., Springfield, Vt.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

CENTERS, Lathe
Adams Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page 336*)

For more information on products advertised, use Inquiry Card, page 247

MOVES FAST: STAYS PUT



Spindle is close to face of head, provides good work visibility while arm is low.

Head and arm design integrated to withstand torsion and compression with very low deflection.

Dovetail slide on arm secures head by clamping three finished surfaces together.

Positive tooth clutch between feed worm and gear box lets operator stop feed while spindle turns and tool gradually "unloads" thrust normally absorbed by arm.

Spindle accuracy and rigidity insured by four angular contact preloaded double zero ball bearings.

▶30 day delivery on most sizes.

Fast response to all controls with minimum effort, plus positive "no-drift" clamping, make it easy for Cincinnati Gilbert operators to get more work done accurately and on time. No one detail is responsible: it's the combination of "clean" design and rugged construction that makes Gilberts consistently pay high returns on your investment. 9" and 11" columns. Ask your Gilbert representative to demonstrate why "those who buy Gilbert buy Gilbert again."

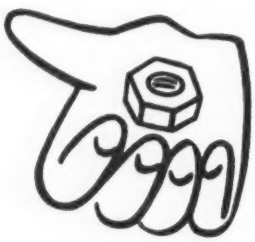
GILBERT

THE CINCINNATI GILBERT MACHINE TOOL COMPANY • 3366 BEEKMAN STREET, CINCINNATI 23, OHIO

HOW DID THE *nut* GET ITS NAME?







The word "nut" probably came into being like almost every other word in the language. Somehow, somewhere, sometime or other, somebody called a nut a nut (maybe it was the same guy who called a spade a spade). Whoever it was, someone else must have heard him say it, and decided to use the name too (which is a neat combination of name-calling and plagiarism). That started it. From there, the word caught on, and tradition did the rest.

Today, Allmetal—maker of stainless steel nuts, screws, bolts, and many other stainless fasteners—owes its good name to a tradition of high quality and fast service. If you need anything from our line, just give us the word.

Our 96-page catalog contains engineering data and weights as well as sizes and dimensions of stock items. If you want a copy, send us a note on your letterhead. Ask for catalog 53Z.

STAINLESS STEEL FASTENERS

ALLMETAL
SCREW PRODUCTS COMPANY, INC.
821 STEWART AVE., GARDEN CITY, L. I., N. Y.

CHAINS, Power Transmission and Conveyor

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

CHISELS AND CHISEL BLANKS

Bethlehem Steel Co., Bethlehem, Pa.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Thor Power Tool Co., Aurora, Ill.

CHUCKING MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co. (Multiple Spindle), Kensington, Conn.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
National Acme Co. (Multiple Spindle), 170 E. 131st St., Cleveland, Ohio.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

CHUCKS, Air Operated

Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Schrader's Son, A., 470 Vanderbilt Avenue, Brooklyn, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Tomkins-Johnson Co., Jackson, Mich.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Collet or Split

See Collets

CHUCKS, Diaphragm

Gleason Works, 1000 University Ave., Rochester, N. Y.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

CHUCKS, Drill

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CHUCKS, Full Floating

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, Staten Island, N. Y.
Gisholt Mch. Co., Madison 10, Wis.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

(*Continued on page* 338)

For more information on products advertised, use Inquiry Card, page 247



We know that those of you who use Ettco-Emrick Tapping Attachments will close your books on a full year of profitable, trouble-free tapping. Now, we'd like to wish all our old friends—and new friends—another happy and prosperous new year.

If fast, accurate tapping with minimum tap breakage and work spoilage contributes in any way to the success of *your* new year—we at Ettco will feel our wish has been granted.

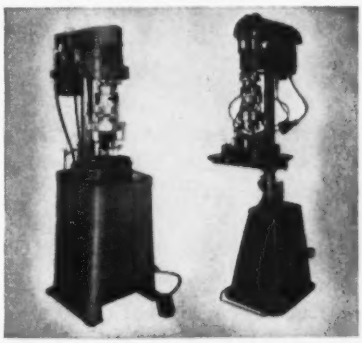
Ettco-Emrick ...for drilling and tapping equipment at its best!

ETTCO TOOL CO. INC., 600 JOHNSON AVE., BROOKLYN 37, N.Y.

Dealers throughout the United States and Canada

DRILLING and TAPPING EQUIPMENT NEWS

Tapping Machines Boost Multiple Head Output



Ettco-Emrick tapping machines are designed for automatic or semi-automatic operation with multiple spindle drilling or tapping heads and single spindle tapping attachments. The No. 72A machine is foot or air-operated. The No. 74 machine is air operated and electrically controlled. *Details in Bulletins No. 72A and No. 74. Write Ettco Tool Co., 592 Johnson Avenue, Brooklyn 37, N. Y.*

Electric Indexing Fixture Has Fast, Precise Action



Ettco-Emrick Indexing Fixtures provide smooth, shockless, positive action. Can be used on any machine base. Synchronization of index fixture with outside machine member is electrically controlled. Utilizes interchangeable nesting plates ranging from 10" to 14" in diameter. *Details in Pulletin No. 97. Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn 37, N. Y.*

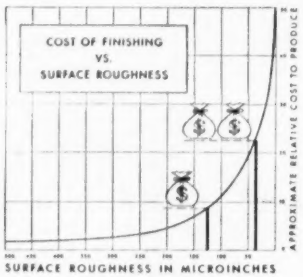
Balanced Tap Chuck Insures Greater Accuracy



Balanced construction of this newly designed precision-made Ettco-Emrick tap chuck eliminates "whipping" action and insures greater accuracy. Light weight and small external dimensions minimize spindle inertia on reversing, making it suitable for either light, sensitive work or heavy duty jobs. Only three sizes needed to cover the complete range of tap capacities from No. 0 to 1". *For details, write Ettco Tool Co., Inc. 592Johnson Ave., Brooklyn 37, N. Y.*

Surface finish control can reduce *your* machining costs

PROPER surface finish control may well yield big savings in your plant by reducing production costs, increasing production rates, and improving product performance.



The chart shows how finishing affects the cost of machined parts. For example, if the surface finish is specified as 125 microinches and you are overfinishing to 32 microinches because of lack of proper gaging equipment, your finishing cost can be twice as much as necessary. To eliminate costly overfinishing, actual checks of machined surfaces should be made in the shop to be sure that specified values are met *but not exceeded.*

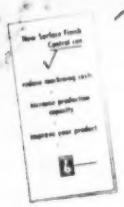
With surface finish control you can eliminate unnecessary operations and operate more efficiently. It helps you improve your products, since surface finish affects many factors in performance, such as break-in time, wear, heat transfer, lubrication, etc.

A new method of Surface Finish Control



THERE is now a simple method of measuring surface roughness on the production line so that the benefits of surface finish control can be realized. The Brush SURFINDICATOR* is a portable inspection tool . . . easy-to-use . . . accurate. This new instrument makes surface roughness measurement a practical shop operation.

*Trade Mark



Get the complete story—get your copy of this new booklet on Surface Finish Control. It offers you the key to reduced machining costs, more efficient use of equipment, and improved products. Write Brush Electronics Company, Dept. Y-12, 3405 Perkins Avenue, Cleveland 14, Ohio.

BRUSH ELECTRONICS COMPANY

INDUSTRIAL AND RESEARCH INSTRUMENTS
PIEZO-ELECTRIC MATERIALS • ACOUSTIC DEVICES
MAGNETIC RECORDING EQUIPMENT
ULTRASONIC EQUIPMENT

BRUSH ELECTRONICS

formerly
The Brush Development Co.
Brush Electronics Company
is an operating unit of
Clevite Corporation.

CHUCKS, Gear

Gleason Works, 1000 University Ave., Rochester, N. Y.
Horton, E., & Son Co., Windsor Locks, Conn.

CHUCKS, Lathes, Etc.

Buck Tool Co., 220 Schippers La., Kalamazoo, Mich.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cushman Chuck Co., Windsor Ave., Hartford 2, Conn.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., Madison 10, Wis.
Jacobs Mfg. Co., West Hartford, Conn.
Jones & Lamson Mch. Co., Springfield, Vt.
Horton, E., & Son Co., Windsor Locks, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Whiton Machine Co., 190 Howard St., New London, Conn.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

CHUCKS, Magnetic

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Hanchett Magna-Lock Corp., Big Rapids, Mich.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

CHUCKS, Power Operated

Skinner Chuck Co., 344 Church St., New Britain, Conn.

CHUCKS, Quick Change and Safety

Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jarvis, Charles L., Co., Middletown, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Universal Engineering Co., Frankenmuth 2, Mich.

CHUCKS, Ring Wheel

Gardner Mch. Co., Div. Landis Tool Co., 414 E. Gardner St., Beloit, Wis.

CHUCKS, Tapping

Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Jacobs Mfg. Co., West Hartford, Conn.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.

CIRCUIT-BREAKERS

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CLAMPING APPLIANCES FOR MACHINE TOOLS

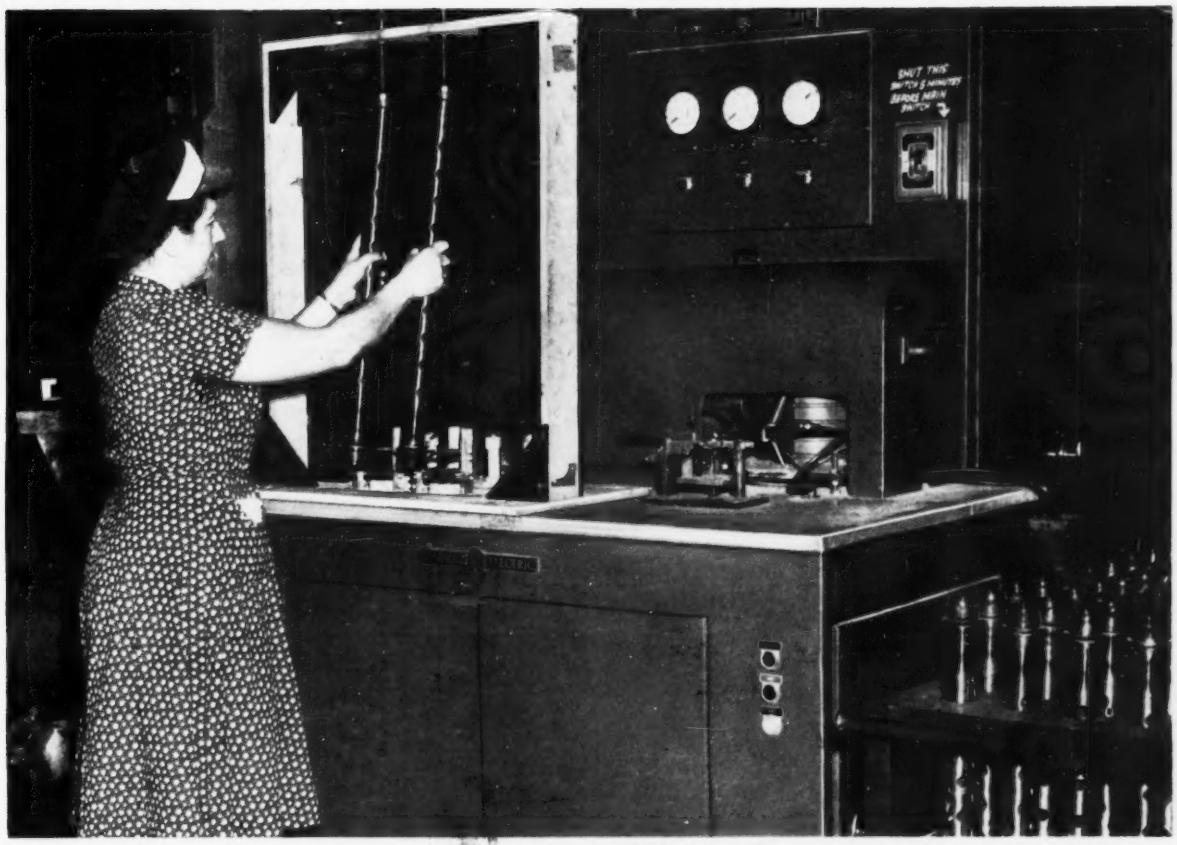
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit, Mich.

CLAMPS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Mead Specialties Co., 4114 N. Knox Ave., Chicago 41, Ill.

(*Continued on page* 340)

For more information on products advertised, use Inquiry Card, page 247



COMPACT G-E HEATERS FOR BRAZING FIT PERFECTLY INTO NEW STRAIGHT-LINE PRODUCTION SETUP AT THE SACO-LOWELL CO.

Rejects Eliminated in Gun-jacket Assembly

Saco-Lowell Company speeds production, cuts costs with G-E Induction Heaters

"In planning our machine-gun production program, we find G-E induction heaters assure us the high-quality brazing necessary to meet strict Ordnance Department requirements," says F. A. Skinner, Chief Engineer, Edwards Plant, Saco-Lowell Shops, Biddeford, Maine.

At Saco-Lowell, brazing rejects are a thing of the past. Only spot checks are necessary for product inspection, because G-E heaters provide a strong, uniform braze time after time. Saco-Lowell saves on operator training too, because use of these semi-automatic G-E heaters is mastered easily in a few hours.

To learn how you can profitably apply induction heat to your metal processing—in brazing, forging, hardening, or annealing—contact your nearest G-E Apparatus Sales representative today. And write now for new, modern-metal-processing bulletin GEA-5889 on furnace and induction brazing to General Electric Company, Section 720-122, Schenectady 5, N. Y.



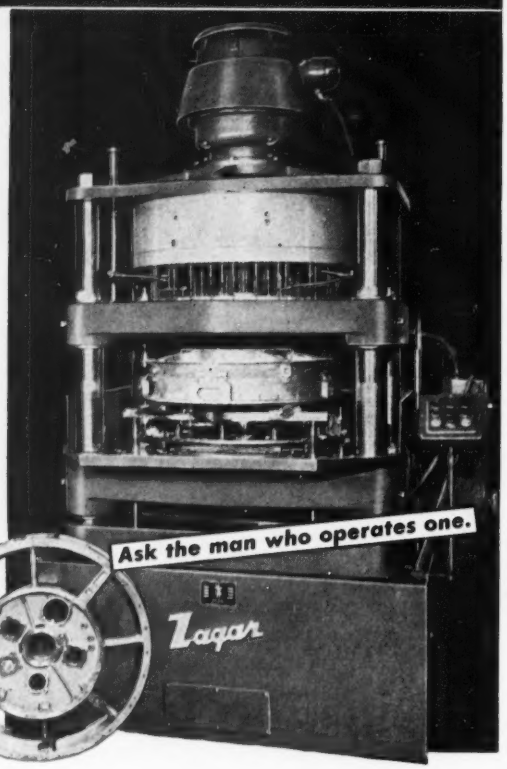
SELECTIVE HEAT produces this clean, strong bond of bearing breach to barrel jacket. Sixty such joints are brazed per hour.

GENERAL ELECTRIC

For more information on products advertised, use Inquiry Card, page 247

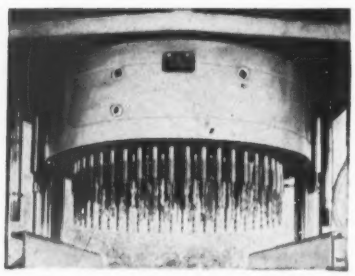
Packard, Too, Uses Zagar ENGINEERED DRILLING IN STANDARD ZAGAR DRILLING MACHINES

Zagar's Exclusive, Rigid 4-Post Construction Permits Hundreds of Holes to Be Drilled in RECORD TIME!



Zagar engineering brought down the time of drilling this part from three hours to seven minutes.

This jet engine part suggests the almost unlimited possibilities in drilling hundreds of holes at one pass. Zagar 4-post machines are built around interchangeable gearless drillheads. Any number of holes on all centers can be drilled as close as twice drill diameter in any material. Zagar's 4-post machines achieve heavy duty, multiple-spindle, close center drilling. . . with greater horsepower and thrust, with better alignment and accuracy, with less breakage of *small drills*. . . Let our engineers calculate your savings by demonstrating the Zagar method.



Zagar Interchangeable Drillhead.

★ ★ ★

Write for Catalog M-12

ZAGAR TOOL, INC. 24000 LAKELAND BLVD. CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Shop Equipment Co., Inc., 8299 W. Tinicum Ave., Philadelphia, Pa.
Starrett, The L. S., Co., Athol, Mass.
Swartz Tool Products Co., Inc., 13330 Foley Ave., Detroit Mich.

CLEANERS, Chemical, for Metal

Bullard Co. Bullard-Dunn Process Div., Brewster St., Bridgeport 2, Conn.
Oakite Products, Inc., 19 Rector St., New York, N. Y.

CLUTCHES

Clearing Mch. Corp., 6499 W. 65th St., Chicago 38, Ill.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Formsprag Co., 23609 Hoover Rd, Van Dyke, Mich.
Link-Belt Co., 300 West Pershing Rd., Chicago 9, Ill.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Rockford Clutch Div., Borg-Warner Corp., 410 Catherine St., Rockford, Ill.
Twin Disc Clutch Co., 1361 Racine St., Racine, Wis.

COLLARS, Safety

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLETS

Brown & Sharpe Mfg. Co., Providence, R. I.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Gisholt Mch. Co., 1245 E. Washington Ave., Madison 10, Wis.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth 2, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

COMPARATORS

See Gages, Comparator.

COMPARATORS Optical

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Eastman Kodak Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., Springfield, Vt.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

COMPOUNDS, Cleaning

Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Oakite Products, Inc., 19 Rector St., New York.

COMPOUNDS, Cutting, Grinding, Metal Drawing, Etc.

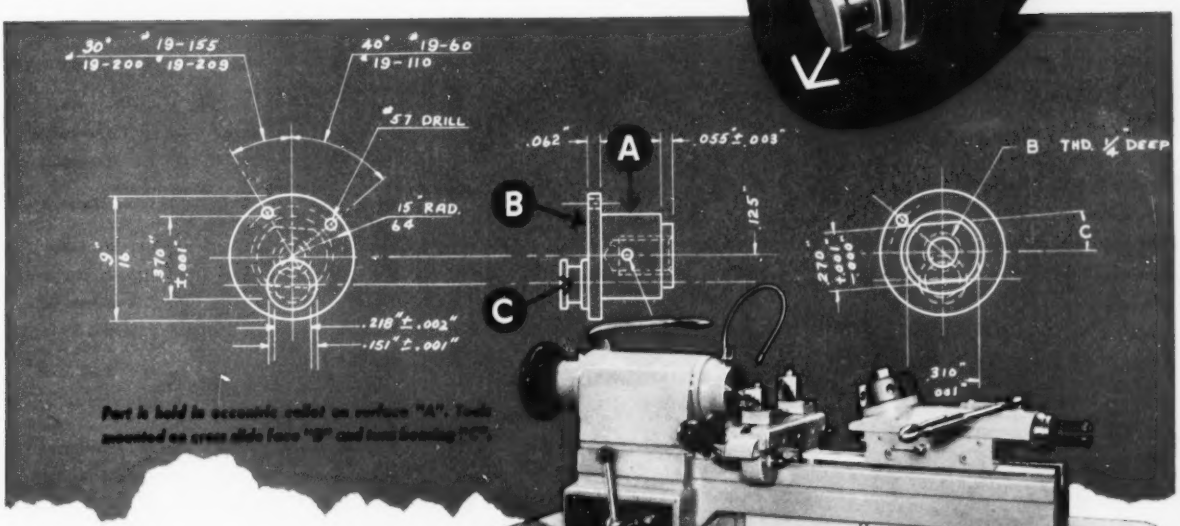
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Broaching & Lapping)
Oakite Products, Inc., 19 Rector St., New York, N. Y.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

(Continued on page 342)

For more information on products advertised, use Inquiry Card, page 247

INSTANT start-stop boosts Penn Fishing Tackle parts to 250 per hour!

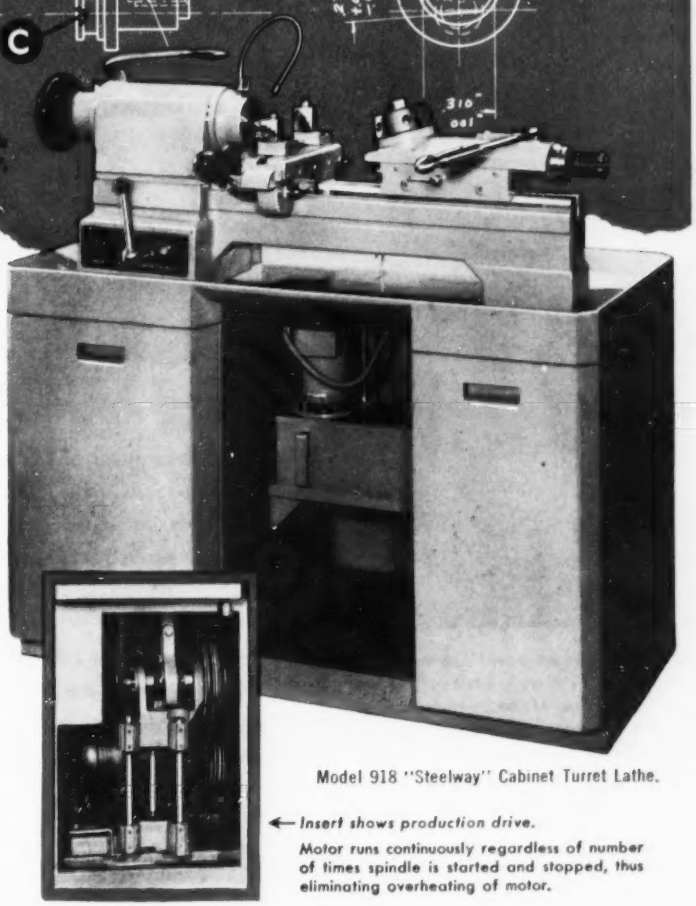




Penn Fishing Tackle Mfg. Co. practices what it preaches. Its officials went fishing recently —to catch some ideas for stepping up production on several eccentric parts. Investigation of the Rivett 918 "Steelway" Cabinet Turret Lathe revealed that machine with its production drive was ideally suited to their requirements.

This production drive features "split-second" starting and stopping of the lathe spindle by movement of the lever chuck closer handle. With one forward pull, the operator closes the collet on the work, releases the brake and engages the spindle drive. When the lever is pushed back, the spindle drive is disengaged, the brake mechanism is applied and the work is released.

Installation of the 918 "Steelway" turret proved immediately successful. Production of troublesome parts was boosted two-fold. A 918 "Steelway" can boost your production, too! Why not go fishing and see what savings can be caught!



Model 918 "Steelway" Cabinet Turret Lathe.

← *Insert shows production drive.*

Motor runs continuously regardless of number of times spindle is started and stopped, thus eliminating overheating of motor.

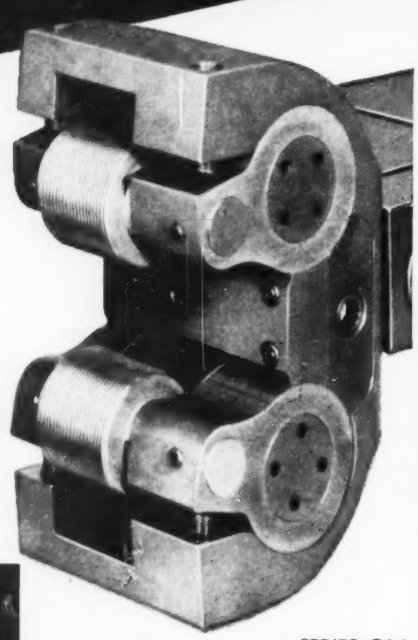
RIVETT

RIVETT LATHE & GRINDER, INC., DEPT MR-12, BRIGHTON 35, BOSTON, MASS.

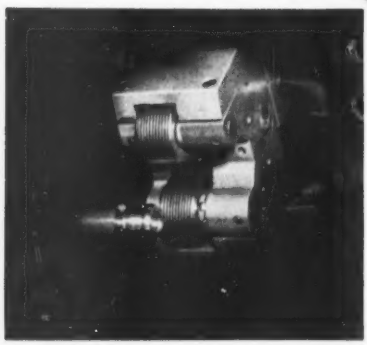
REED RTD

Four Standard Thread Rolling Attachments

For more than 100 Sizes of Automatics



Operating from the cross slides of automatic screw machines, each size is adjustable to accommodate an infinite range of work diameters within its capacity. Maximum thread rolling capacity within the tooling sector of over 100 sizes of single and multiple spindle automatic screw machines is possible through the selection of one of the four standard attachments.



SERIES G2A

Reed attachments have two opposed rolls which pass over the work when rolling the thread. They are easy to set up and rolls may be quickly changed and adjusted for size. A simple device provides precise matching of the rolls.

The attachment consists of two units, a head and an adapter. The heads are of compact rigid design and are assembled to an adapter by a floating swivel connection. Adapters are of the solid or adjustable type, and are designed for various cross slide positions on the automatics. A large assortment of adapters are available that permit more than 300 cross slide applications.

Send us specifications of your requirements and let us supply you with complete information.

REED ROLLED THREAD DIE CO.

THREAD ROLLING MACHINES and DIES • KNURLS • THREAD ROLLS
Worcester, Massachusetts, U. S. A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Detroit, Englewood, N. J., Houston Indianapolis, Milwaukee, Montreal, New York City, Philadelphia, Pittsburgh, St. Louis, Syracuse, Toronto

027

COMPOUNDS, Resin and Molding

Bakelite Co., Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
General Electric Co., Schenectady 5, N. Y.

COMPRESSORS, Air

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Ingersoll-Rand Co., Phillipsburg, N. J.

CONTOUR FOLLOWER

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Turchan Follower Machine Co., 8259 Livernois and Alaska Aves., Detroit, Mich.

CONTRACT WORK

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Diefendorf Gear Corp., 920 N. Belden, Ave., Syracuse, N. Y.
Eisler Engrg. Co., Inc., 760 S. 13th, Newark 3, N. J.
Fellows Gear Shaper Co., Springfield, Vt.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland, Ohio.
Minster Machine Co., Minster, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Mummert-Dixon Co., Hanover, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Mch. Tool Co., 250 Kishwaukee St., Rockford, Ill.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphia, Pa.

CONTROLLERS

Allen-Bradley Co., 1326 S. 2nd St., Milwaukee.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

CONTROLS, THERMO

Control Products, Inc., 306 Sussex St., Harrison, N. J.

CONVEYORS FOR DUST, CHIPS, ETC.

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9.

COOLANT COOLERS

Frostrode Div. Viking Products, 3066 East Outer Dr., Detroit 34, Mich.

COOLANT SEPARATORS

See Separators, Oil or Coolant.

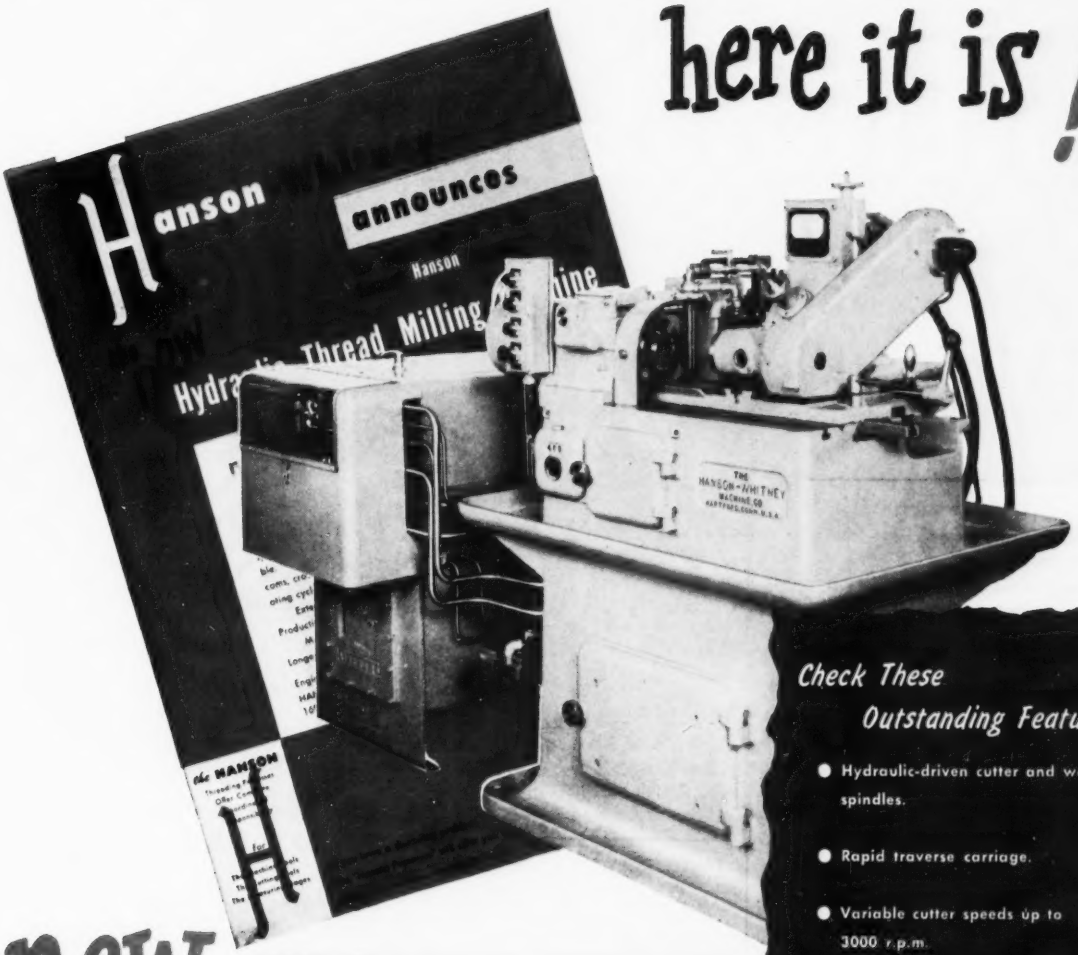
COUNTERBORES

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allen Mfg. Co., 133 Sheldon St., Hartford 2, Conn.
Besly-Welles Corp., Beloit, Wis.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

(Continued on page 344)

For more information on products advertised, use Inquiry Card, page 247

here it is!



new HYDRAULIC THREAD MILLING MACHINE

Check These Outstanding Features

- Hydraulic-driven cutter and work spindles.
- Rapid traverse carriage.
- Variable cutter speeds up to 3000 r.p.m.
- Permits use of carbide cutters where applicable.
- Lead cams and cross-feed cams.
- Semi-automatic operating cycles.

. . . a new *Hanson* process that permits maximum operation efficiency under the widest possible range of conditions.

Simply by turning a dial, *even during operation,* operator can adjust machine to *coordinate* all machining elements.

As a result, production rates can be increased and maintained, and cutter life can be considerably increased.

Manufactured in the following capacities: 4" x 9", 8" x 16", 10" x 24", 15" x 30". Longer beds and larger swings to suit customers' requirements.

If you have a threading problem, the "Hanson Process" will offer you the most economical solution. Investigate today!

the **HANSON**
Threading Processes
Offer Complete
Coordinated
Responsibility
For
The Machine Tools
The Cutting Tools
The Measuring Gages

Engineered, Produced and Sold by the
HANSON-WHITNEY DIVISION of the WHITNEY CHAIN CO.
160 Bartholomew Avenue Hartford 2, Connecticut, U. S. A.

THREAD MILLING MACHINES • SMALL TOOLS • GAGES

10HW88A

It isn't KENDEX* unless it's KENNAMETAL*



KENDEX* is the Registered Trade-Mark of Kendex Tools which are made exclusively by Kennametal Inc.

Kendex tools feature a precision-ground, multiple-edge, screw-mounted, indexable Kennametal insert that needs no regrinding. When the insert's multiple cutting edges become dull, to throw it away is economical practice. Replacement cost is slight compared to that of regrinds.

Kendex tooling minimizes downtime for tool changing, eliminates tool grinding expense, and ends the false economy of reconditioning tools that have outlived their usefulness. Ask your nearest Kennametal representative for details. Kennametal Inc., Latrobe, Pa.

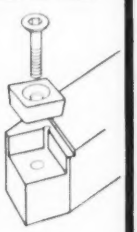
*Registered Trade-Marks

How KENDEX* Works



1 Hard, strong, wear-resistant Kennametal is molded into square, round, or triangular Kendex inserts, which are precision ground.

2 Kendex inserts are mounted to suitable tool holders with socket head screws.



3 When edge becomes dull, insert is turned to new cutting position. When all cutting edges have been used, insert is thrown away; no regrinding.



KENNAMETAL*
CEMENTED CARBIDE TOOLING THAT INCREASES PRODUCTIVITY
SALES OFFICES IN PRINCIPAL CITIES



A-2

Standard Tool Co., 3950 Chester Ave., Cleveland Ohio
Starrett, The L. S. Co., Athol, Mass.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

COUNTERSHAFTS

Standard Pressed Steel Co., Jenkintown, Pa.

COUNTERSINKS

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 120 Oakman Blvd., Detroit 32, Mich.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Peck, Stow & Wilcox Co., Southington, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.

COUNTERS, Revolution

Brown & Sharpe Mfg. Co., Providence, R. I.
Millers Falls Co., Greenfield, Mass.
Starrett, The L. S. Co., Athol, Mass.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUNTING DEVICES

Starrett, The L. S., Co., Athol, Mass
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

COUPLINGS, Flexible

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.
Philadelphia Gear Works, Erie Ave., and G St., Philadelphia, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

COUPLINGS, Shaft

Boston Gear Works, 3200 Main St., North Quincy, Mass.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Electric Traveling

Cleveland Crane & Engrg Co., Wickliffe, Ohio.
Morgan Engrg Co., Alliance, Ohio.

CUTTER GRINDERS

See Grinding Machines, for Sharpening Cutters, Reamers, Hobs, Etc.

CUTTERS, Gear

Brown & Sharpe Mfg. Co., Providence, R. I.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.

(Continued on page 346)

Illustrated are but a few of the many popular W & B drills and reamers. Complete lines of High Speed and Carbon Steel drills and reamers are also available. Catalog No. 105, available upon request, lists and illustrates the complete Whitman & Barnes line of quality tools.

Select W & B Carbide Drills and Carbide Reamers





CARBIDE TAPER SHANK DRILLS

For efficient high speed drilling of cast iron, plastics, non-ferrous and abrasive materials. Diameters from ⅛" to 1¼".



CARBIDE STRAIGHT SHANK JOBBERS' DRILLS



CARBIDE TAPER SHANK FOUR FLUTE CORE DRILLS

Have the same application and high speed efficiency characteristics found in above standard length drills. Diameters from ⅛" to ½".



CARBIDE STRAIGHT SHANK CHUCKING REAMERS

These drills are specifically designed to efficiently enlarge cored, drilled or punched holes. Diameters from ½" to 1½".



CARBIDE MASONRY DRILLS FASTLEAD OR REGULAR SPIRAL

Particularly applicable for reducing costs on turret lathe and screw machine reaming of metals. Diameters from 3/16" to 1½".



CARBIDE STUB SCREW MACHINE REAMERS

Provide fast, easy drilling of concrete, cement, brick, slate, marble, stone and all types of masonry. Diameters from ⅛" to 1½".



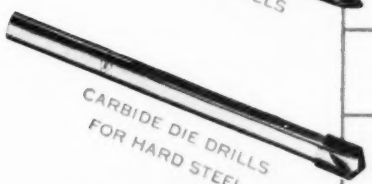
CARBIDE GLASS DRILLS

Carbide extends full length of barrel preventing scoring or galling and insuring high-finish hole. Diameters from .1881" to 1.010".



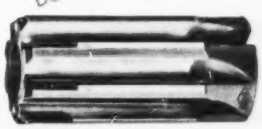
CARBIDE HARD STEEL DOWEL PIN REAMERS

Quickly drill smooth, uniform holes in glass with little or no chipping and without cracking. Diameters from ⅛" to ½".



CARBIDE DIE DRILLS FOR HARD STEEL

For cost saving reaming of dowel pin holes in hardened die steels—eliminate time consuming annealing. Diameters from ¼" to ¾".



CARBIDE STRAIGHT FLUTE SHELL REAMERS

Save time by drilling hardened steel in the range of Rockwell C40-65 without expensive annealing. Diameters from 1/16" to ¾".

W&B carbide straight flute shell reamers are carefully designed for easy and firm arbor mounting. Diameters from ¾" to 3".

W&B

DRILLS
REAMERS
COUNTERBORES
COUNTERSINKS
CARBIDE TOOLS
TOOL BITS
SPECIAL TOOLS

Contact Your Local W & B Distributor

"Makers of Fine Tools Since 1848"

WHITMAN & BARNES

PLYMOUTH, MICHIGAN

NEW YORK • CHICAGO • LOS ANGELES • HOUSTON

For more information on products advertised, use Inquiry Card, page 247

In this

MONARCH of DEFENSE



CIRCLE L

LEBANON Castings *are at work*

IN TANKS—those rumbling, roaring monarchs of our Ground Forces—vital points are protected with armor castings made by Lebanon Steel Foundry. For the Detroit Arsenal alone, Lebanon has produced over 60,000 armor castings—principally ventilating grille louvre doors and corner hull brackets for the M46, M47 and the current M48 medium (General Patton) tanks.

As early as 1935, Lebanon Steel Foundry cooperated with Army Ordnance in the development of cast armor. In 1952 Lebanon received a citation for designing and casting top-quality louvre doors for the medium tank. The engineering and production skills of Lebanon craftsmen have ably contributed to practically every tank development and production program since cast armor became a reality.

See—STEEL WITH A THOUSAND QUALITIES—37 min., 16 mm, semi-technical, full-color, sound film on the making of steel castings. For information write: Dept. X, Lebanon Steel Foundry.

LEBANON Castings

CARBON, SPECIAL ALLOY AND STAINLESS STEEL

CIRCLE L

LEBANON STEEL FOUNDRY LEBANON, PA.

Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNicholas Rd., Detroit 12, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich. (Shaving).
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio
Union Twist Drill Co., Athol, Mass.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Keyseater

Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

CUTTERS, Milling

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Atrax Co., Newington, Conn.
Barber-Colman Co., Rock St., Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429 Royal Oak, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich. (Thread)
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 1440 Woodrow Wilson, Detroit, Mich.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
National Twist Drill & Tl. Co., Rochester, Mich.
OK Tool Co., Milford, N. H.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Willey's Carbide Tool Co., 1340 W. Verner Hwry., Detroit 1, Mich.

CUTTERS, Rotary

See Files & Burs, Rotary.

CUTTING COMPOUNDS

See Compounds, Cutting, Grinding, Etc.

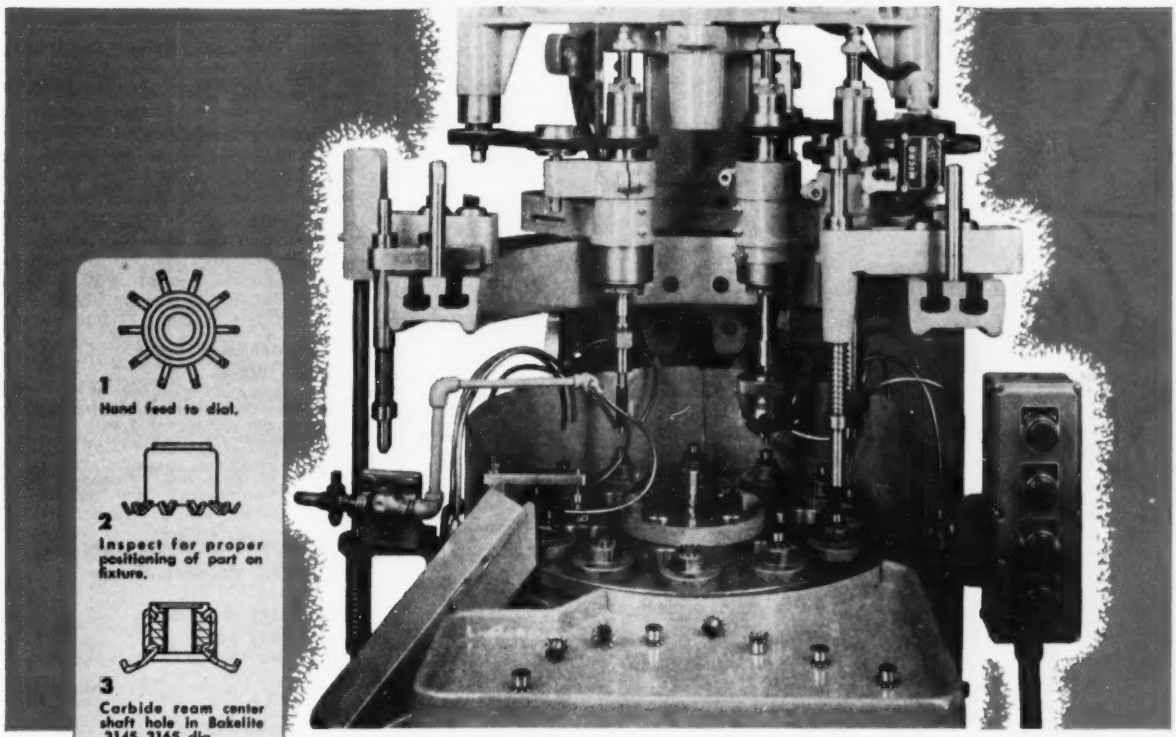
CUTTING AND GRINDING FLUIDS

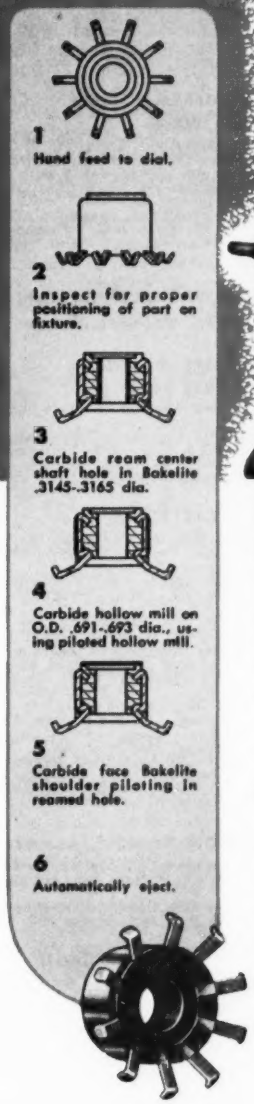
Cimcool Div., Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Continued on page 348)

For more information on products advertised, use Inquiry Card, page 247

Bodine CASE HISTORY NO. 36





PROCESSING A COMMUTATOR FOR A SMALL ELECTRIC MOTOR (Copper, molded in Bakelite)

FEATURING . . .

Carbide tools to (1) maintain high production speeds and longer tool life in extremely abrasive materials; (2) maintain close tolerances on machining operations.

PRODUCTION:

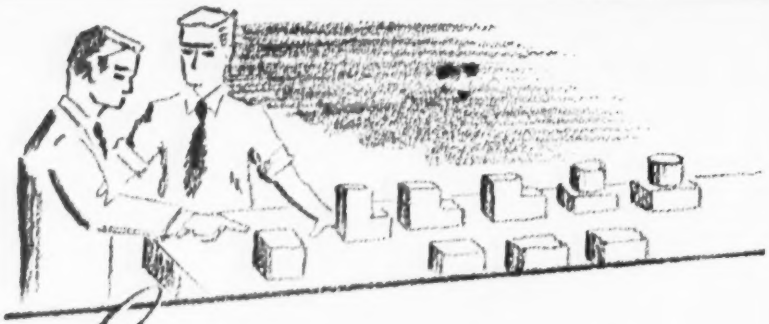
1070 pieces per hour at 85% efficiency. Machine used is the Bodine Model 41-20 tooled as a straight driller. This model can be tooled for drilling, tapping, milling, single or double screw inserting, and assembly operations . . . or any grouping desired. If you require high speed production at low costs, this is your machine.

"You Can't Meet Tomorrow's Competition With Yesterday's Machine Tools"

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

3BD53

For more information on products advertised, use Inquiry Card, page 247



Cut **PRODUCTION COSTS with the** *right* **plant layout**

Many of our clients are amazed by the cost savings realized when we "revamp" their plant layouts. This entails the rearrangement in equipment, the elimination of unnecessary handling operations, and the complete reorganization and integration of their "production flow".

The right kind of plant layout stems from an objective approach toward every phase of production. It helps to iron out all the production "kinks", reduce inventories, lower handling time, eliminate back-tracking, and assist in production control.

Pioneer has developed a thorough system of procedure in transferring the poor plant layout into one that reaps cost savings far beyond anything anticipated by the client. This procedure entails the preparation of process flow charts, taking into consideration such factors as methods, material handling, temporary and permanent storage, and inspection of materials. The flow chart is then transferred into a set of templets . . . or scale models . . . which is developed into a plant layout, allowing us to analyze the client's production from all angles.

We'll be glad to help show you how to cut production costs . . . with the right plant layout . . . tailored to meet your specific production needs! Send today for Bulletin 162-G on "How to Harness Your Production".

Pioneer
ENGINEERING
& MANUFACTURING CO., INC.

19,643 JOHN R ST. DETROIT 3, MICH.

Shear-Speed Chemical Products, Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 Fifth Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

CUTTING-OFF MACHINES

Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cone Automatic Mch. Co., Windsor, Vt. (Lathe Type).
Consolidated Mch. Tool Co., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Machine Co., Waynesboro, Pa. (Pipe).
Modern Machine Tool Co., 601 S. Water St., Jackson, Mich. (Lathe Type for Tubing).
Pines Engineering Co., Inc., Aurora, Ill.

CUTTING-OFF MACHINES, Abrasive Wheel

Allison Co., Bridgeport, Conn.
Campbell Mch. Div., American Chain & Cable, 929 Conn. Ave., Bridgeport, Conn.
Columbia Machinery & Engrg. Corp., Hamilton 1, O.
Delta Power Tool Div., Rockwell Mfg. Co., 614 G. N. Lexington Ave., Pittsburgh 8, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.

CUTTING-OFF MACHINES, Cold Saw

See Sawing Machines, Circular.

CUTTING-OFF MACHINES, Metal Band Saws

Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Grob Bros., Grafton, Wis.

CUTTING-OFF TOOLS

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Luers, J. Milton, 12 Pine St., Mt. Clemens, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

CUTTING-OFF WHEELS, Abrasive

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester, Mass.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.

CYLINDER BORING MACHINES

Baker Bros., Inc., Sta. F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

CYLINDERS, Air

Bellows Co., 230 W. Market St., Akron, Ohio.
Hannafin Corp., 1101 S. Kilbourn Ave., Chicago.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Tomkins-Johnson Co., Jackson, Mich.

(*Continued on page* 350)

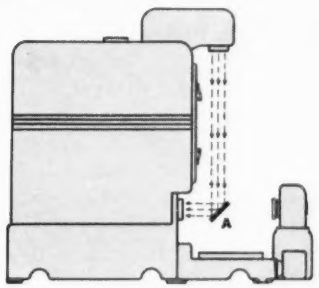
For more information on products advertised, use Inquiry Card, page 247

Plain Pointers on Projection

AMONG the definitions listed by Webster for the adjective *universal* is: "adapted or adaptable to all or to various uses, sizes, shapes, et cetera"—a definition we like to feel applies to Kodak Contour Projectors.

Admittedly, we make two projectors, one for routine inspection gaging (the low cost of which might surprise you) and a second for toolroom use affording measurements to "tenths." Optically, however, these two instruments are one. And it's their optical system which makes them truly "universal."

Back in the early days of design, our engineers set out to provide in a single contour projector light sources both for horizontal and for vertical shadow projection. They also developed the unique Kodak Surface Illuminator, a self-contained light source which affords surface projection in either plane. Their reasoning was economic. By combining these features, the instrument could be easily adapted to a wide range of parts; the more uses to which the projector might be put, the sooner it would pay for itself in the shop.

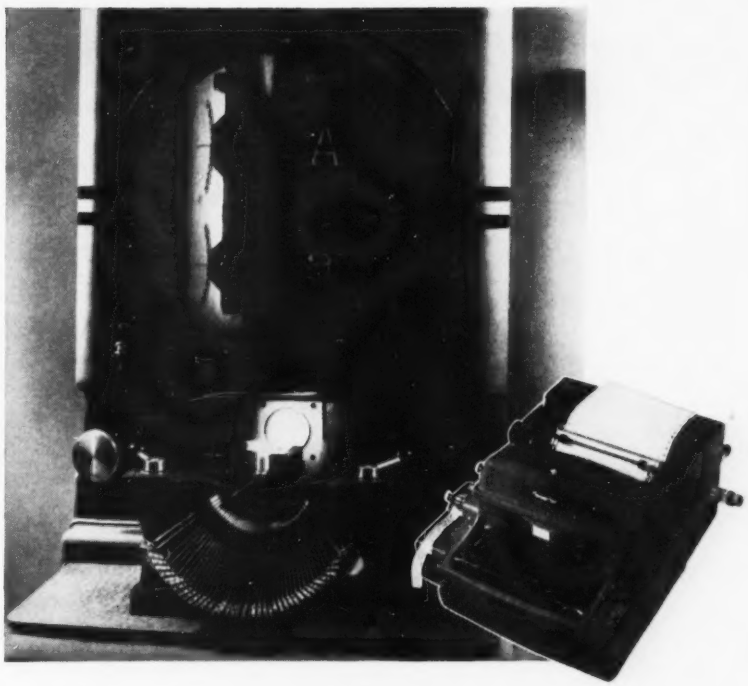


Above drawing illustrates how vertical light source is utilized. With part on a glass staging platform, image is reflected by mirror (A) into optical system of projector.

Nothing has happened since the design stage to shake us in this belief. However, we have been somewhat surprised by some of the highly ingenious ways in which our projectors are used: as in the case of the typewriter fixture (illustrated in our advertisement at the right), where the surface illuminator yields a simultaneous plan and profile view of the type bar face.

Equally ingenious, if not more so, is a device which employs both the horizontal and vertical light beams to simultaneously project the shadow image of a shaft and a reticle scale for gaging its tolerances. A description of this application, which runs to more words than space here affords, is available on request from the Special Products Sales Division, Eastman Kodak Company, Rochester 4, N. Y. Just ask for the folder on the new, universal shaft checking fixture.

Applications such as these have opened the eyes of many engineers to the fact that inspection by optics today has overcome traditional limitations. In the best sense of Webster, contour projection may be "adapted to various uses, sizes, shapes, et cetera." And to the solution of various problems in inspection and precision measurement, including, perhaps, your own.



This "3-D picture" showed the way to cut aligning time 25%

What you see here on the Kodak Contour Projector is both the *front* and *side* view of a typewriter type bar—a picture that helped reduce aligning time 25% at Commercial Controls Corp., manufacturers of tape-controlled Flexowriters and Justowriters.

Light reflected from the surface of the type character provides an image for rapidly checking horizontal and vertical alignment of the letter. Simultaneously, mirrors in the special holding fixture project a profile image of the type—yield an accurate check of the desired position of the letter as it will contact the platen. Only the Kodak Contour Projector's unique surface illuminator makes possible this combined plan and profile view.

Alignment of type is a critical factor on these automatic machines which type at 100 words a minute and must produce copy for printing reproduction. Until recently, Commercial Controls had to perform this inspection operation during final assembly. Now, this new gaging technique has made it possible to inspect the type bars immediately after their removal from the soldering jigs. Each bar is quickly moved into place and compared with the tolerance lines of the chart-gage on the screen. Alignment of letters is held to a tolerance of ±.0002", contact to ± .0015". And, by catching errors at this point, aligning time has been cut 25%.

Perhaps the speed, precision, and economy of optical gaging can help you solve a difficult inspection or measurement problem. There is a field representative in your area who will be glad to discuss your problem with you. You can get in touch with him or obtain a copy of the booklet, "The Kodak Contour Projector," by writing to:

Special Products Sales Division
EASTMAN KODAK COMPANY
Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

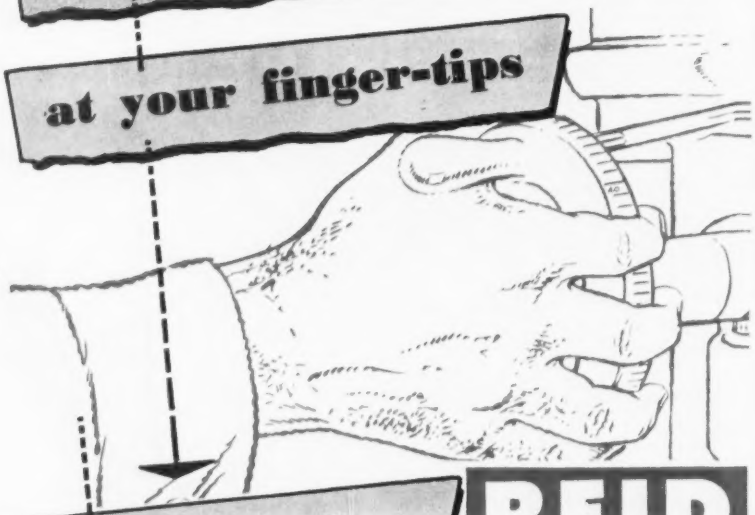
Optical Gaging

A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak

You have precision

at your finger-tips

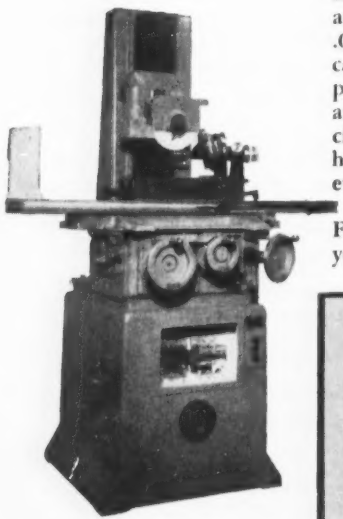


when you use REID GRINDERS

Every move counts, with no tiresome reaching or bending, when you operate a Reid. All controls are right at finger-tip level . . . always under your complete control, reacting instantly, without backlash or wheel play.

Such dependable performance, the result of Reid's built-in accuracy, insures precision to meet the closest tolerances. When the shop order reads .0001", put the work on a Reid and you can be sure that the finished piece will pass inspection. Reid Surface Grinders are designed and precision-built by specialists who put the results of over a half-century of experience into their every detail.

Find out the full story on Reid Features for Better Grinding: request your copy of Bulletin 618-2.



Elevating hand wheel, graduated in .0005"
Optional: Vernier, graduated in .0001", for elevating hand wheel
Cross feed hand wheel, graduated in .001"
Power feed (Model 618V), automatic adjustable cross feed from .006" to .100" at each reverse of table.
Table speed, 12-35 feet per minute
Work capacity: 6" x 18"
Table size: 51" x 8"
Standard wheel: 7" x ½" x 1¼"

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

CYLINDERS, Hydraulic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Barnes, John S., Corp., Rockford, Ill.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
National Forge & Ordance Co., Irvine, Warren County, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DEALERS, Machinery

Botwinik Bros. of Mass., Inc., 14 Sherman St., Worcester, Mass.
Motch & Merryweather Mchry. Co., Penton Bldg., Cleveland, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.

DEMAGNETIZERS

Blanchard Mch. Co., 64 State St., Cambridge, Mass.
Heald Mch. Co., 10 New Bond St., Worcester 6, Mass.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Taft-Pierce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Inc., Worcester, Mass.

DESIGNERS, Machine and Tool

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Hartford Specialty Mchry. Co., 287 Homestead St., Hartford, Conn.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Pioneer Engrg. & Mfg. Co., 19679 John R St., Detroit, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

DIAMONDS AND DIAMOND TOOLS

Smit, J. K., & Sons, Inc. Murray Hill, N. J.

DIE-CASTING

See Castings, Die.

DIE-CASTING MACHINES

Hydraulic Press Mfg. Co., Mt. Gilead, Ohio.
Lake Erie Engineering Corp., Kenmore Station, Buffalo, N. Y.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.

DIE CUSHIONS

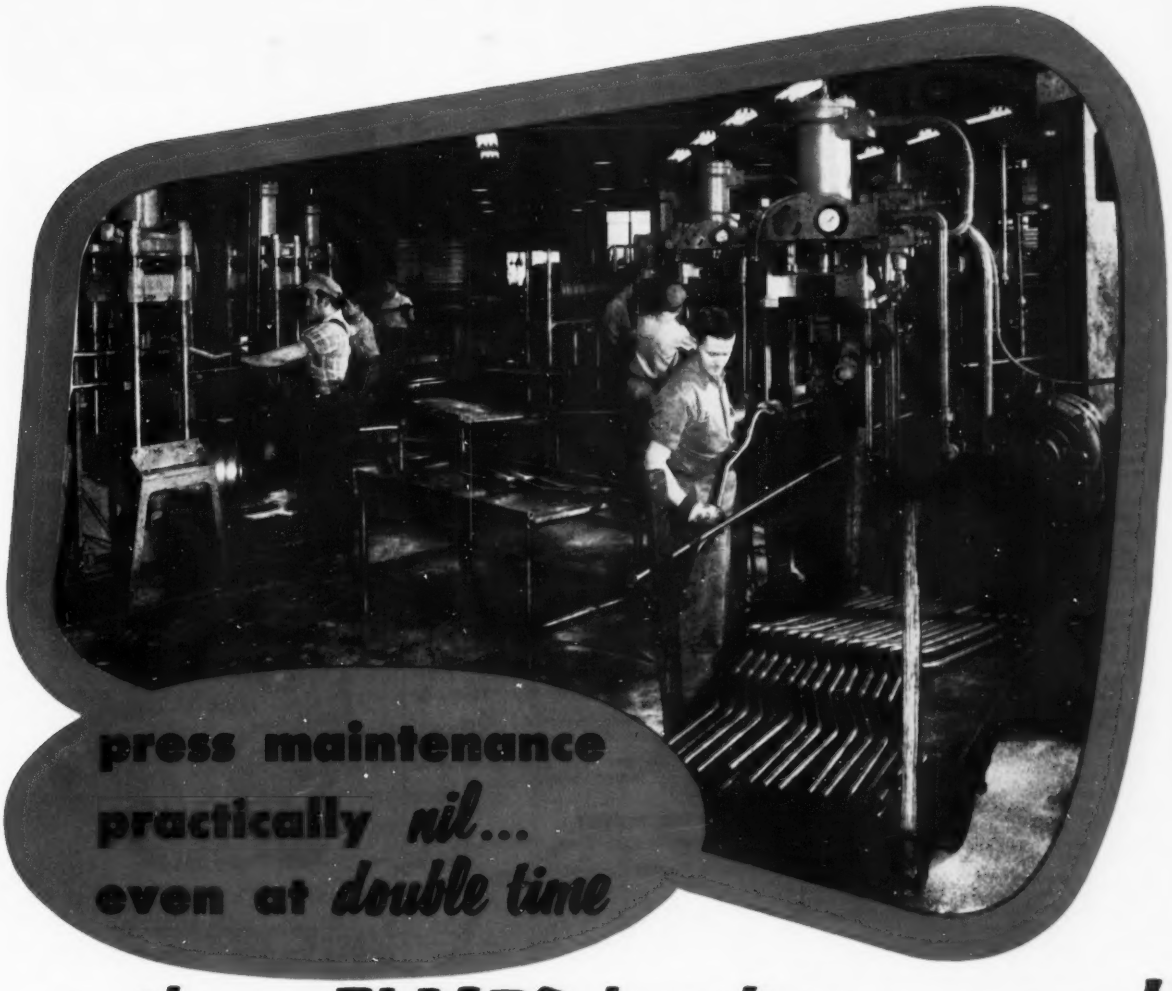
Bliss, E. W. Co., 1375 Raff Rd., S. W. Canton, Ohio.
Clearing Mch. Corp., 6499 W. 65th St., Chicago, Ill.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.

DIE INSERTS, Carbide

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Kennametal Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

(*Continued on page 352*)

For more information on products advertised, use Inquiry Card, page 247



press maintenance practically *nil*... even at *double time*

on these ELMES bending presses!

Six out of ten Elmes® Hydraulic Tube Benders in operation at Tube Products Corporation, Tipp City, Ohio, are shown above. Used for forming exhaust and tail pipes for automobile, airplane, and diesel engines, these six presses have been in service for four years; the remaining four Elmes presses, not shown, have been in service for eight years.

"These ten presses are in constant operation at least 8 hours daily," says Mr. E. C. Sonnanstine, Tube Products' executive vice-president. "In fact, at least 50% of the time they are in operation for 16 consecutive hours. Yet with all this heavy-duty operation, practically *no* maintenance has been required—only normal replacement of worn gaskets.

"We feel that the use of this equipment, with its simple tooling and exceptionally high operating speed, enables us to produce in quantities a quality product at the lowest possible cost to our customers."

Elmes Hydraulic Metalworking Presses have an enviable reputation for *maintaining* high production . . . because Elmes *builds* performance into its press designs . . . the kind of performance that only 102 years of specialized engineering experience can produce. Whatever your press requirements—for drawing, forming, straightening, bending, hobbing, forcing, etc. — let Elmes' long experience be your guide to better, faster, lower-cost production. Press recommendations and cost estimates are yours for the asking.

American Steel Foundries

ELMES ENGINEERING DIVISION

1162 TENNESSEE AVENUE CINCINNATI 29, OHIO

DISTRIBUTORS IN PRINCIPAL INDUSTRIAL CENTERS —— ALSO MANUFACTURED IN CANADA

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES

AVAILABLE FROM STOCK

Hundreds of U.S. plants* are cutting costs . . . increasing production with these German Precision Machine Tools

All designed for standard American voltages and frequencies; calibrations and lead screws in inches. Materials and workmanship guaranteed. Complete operating instructions in English.

DRILL PRESS, Alfing—26" x 28" table, 1¼" capacity. $1,985.

GRINDER, CARBIDE TOOL, Thielenhaus—4 grinding stations, rough to finest finish. $1,600.

GRINDER, TOOL & CUTTER, Reinecker—8" x 15¾", all attachments. $3,195.

GRINDER, UNIVERSAL, Ferrari—8½" x 19¾" $8,500.

JIG BORERS, OPTICAL, Lindner—32" x 16" and 44"x24" table. $20,925 & $32,998 resp.

LATHES, ENGINE, Goeppingen—18" x 60" $6,230.

LATHES, ENGINE, Heyligenstaedt — 24½" x 78½" and 20" x 118½". $13,000 & $10,500 resp.

LATHES, ENGINE Lieber—16" x 60". $3,900.

LATHE, GAP, Heyligenstaedt—Swing 24½" in Gap; 45" without lead screw. $11,750.

LATHE, HEAVY DUTY, V D F—30" swing; 22'11" between centers. $25,000.

LATHE, PRODUCTION PRECISION, Magdeburg 11" x 19½". $2,967.

LATHE, RELIEVING, Reinecker—9-7/16" center height; 24" between centers $10,362.

LATHE, TURRET, Scheu—2" capacity; Swing 17". Comp. accessories $11,000.

MILLER, CLIMB PRODUCTION, Jerwag—55" x 14". $9,894.

MILLER, HORIZONTAL, Biernatzki — 59" x 12½". $8,540.

MILLER, PATTERNMAKER'S, Bohner & Kohle 48" x 28"; $9,987.

MILLER, UNIVERSAL, Biernatzki — 59" x 12½", Morse Taper 5, rapid traverse. $9,400.

MILLER, UNIVERSAL, Hueller — 11¼" x 48½". $5,550.

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MILLER, VERTICAL, Hurth, 48" x 13¾" $7,000.

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SCREW MACHINE, HAND Hestika — 1" capacity. $2,300.

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SHAPER, MECHANICAL, Klopp — 17", 21" stroke. $2,486 & $3,194 resp.

*Names on request.

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U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

DIEMAKING MACHINES

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Grob Bros., Grafton, Wis.
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Oliver Instrument Co., 1410 E. Moumee St., Adrian, Mich.
Precise Products Corp., 1328-30 Clark St., Racine, Mich.

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Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
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DIE STOCKS

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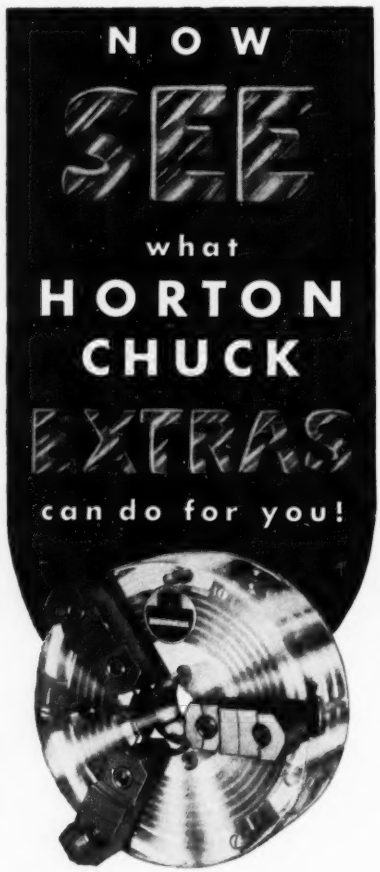
DIES, Sheet Metal, Etc.

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Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bliss, E. W., Co., 1375 Raff Rd., S. W. Canton, Ohio.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chambersburg Engrg. Co., Chambersburg, Pa.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Dreis & Krupp Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Mch. Co., Bridgeton, N. J.
John B., Manufacturing Co., Ellis St., New Britain, Conn.
Metal Carbides Corp., Youngstown, Ohio.
Mullins Manufacturing Corp., Salem, Ohio.
Niagara M ch. & Tool Wks. 683 Northland Ave., Buffalo, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Waltham Mch. Wks., Newton St., Waltham, Mass.
Winzeler Mfg. & Tool Co., 1712 West Arcade Pl., Chicago 12, Ill.

DIES, Threading

Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Mansfield, Mass.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Geometric Tool Co., Westville Station, New Haven 15, Conn.

(*Continued on page 354*)



SEE the actual operation of a Horton Chuck with the new Plastic Demonstrators.

NOTICE the pilot hole construction of the independent chuck and the replaceable pinion bushings of the Scroll Universal Chuck — both Horton Exclusives.

ASK your Horton Distributor for a demonstration now. or write to . . .

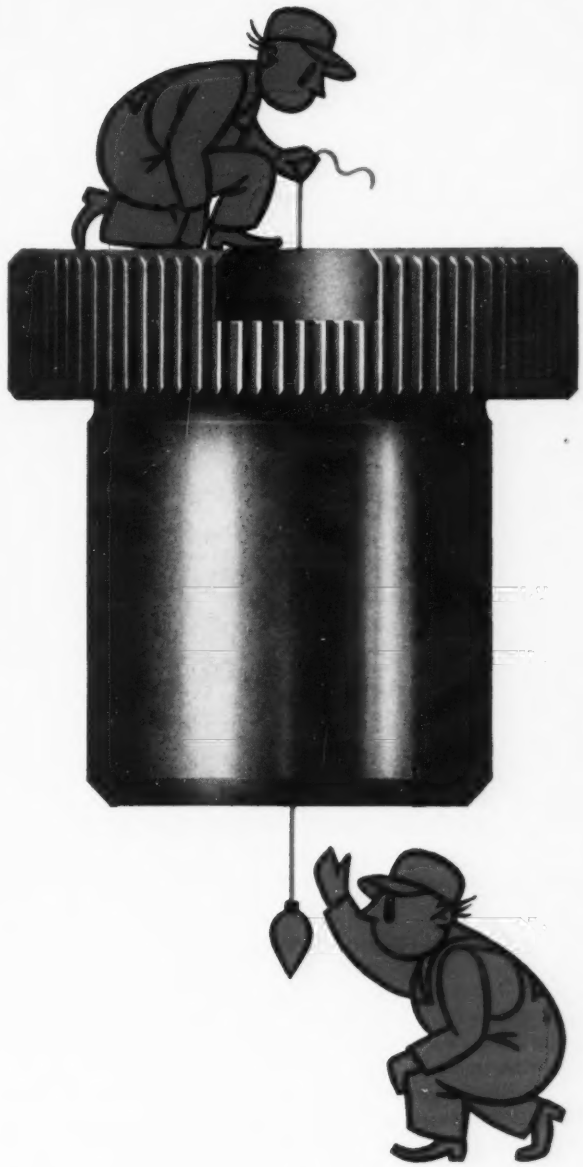
HORTON CHUCK
Windsor Locks, Conn.

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FOR PERFECT ALIGNMENT...

UNIVERSAL
DRILL BUSHINGS

Universal Drill Bushings help increase efficiency and simplify jig drilling operations by insuring perfect alignment of drills. Blended radius on the top inside diameter guides the drill into place and helps prevent tool hang-up and breakage. Superhoned bores keep tool wear to a minimum, especially in close tolerance work. 100% concentricity and hardness tests insure accuracy and uniform high quality. Knurled heads provide a quick, sure grip. Made in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N.J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.



178

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 2
MICHIGAN



1	STANDARD COLLET CHUCK
2	FLOATING COLLET CHUCK
3	BORING CHUCK
4	"KWIK-SWITCH" TOOL HOLDER
5	MIKRO-LOK BORING BAR
6	STANDARD DRILL BUSHING
7	UNIVERSAL INDEX PLUNGER



Farquhar Hydraulic Press at the Weirton Steel Company straightens stopper rods. It has doubled production, required practically no maintenance.

Farquhar Hydraulic Press

at the Weirton Steel Co.

"eliminates breakage of rods... increases production 100%"

The Weirton Steel Co., Weirton, W. Va., formerly straightened stopper rods with a steam hammer. The operation was slow and resulted in a high percentage of breakage. Seeking a better method, Weirton officials bought a Farquhar Press to speed production. Not only has the press increased production 100%, but it has eliminated breakage of rods. In addition, Weirton reports that in the six years this press has been operating, "practically no maintenance has been necessary."

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Farquhar engineers are ready to help solve whatever production problem you may have. Send for free catalog showing Farquhar Built-for-the-Job Presses in all sizes and capacities. Write to THE OLIVER CORPORATION, A. B. Farquhar Division, *Hydraulic Press Dept.*, 1504 Duke St., York, Pennsylvania.

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Extruding • Jogging • Forging • and other Metalworking Operations
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Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Winter Bros. Co., Rochester, Mich.

DIES, Threading, Opening

Eastern Mch. Screw Corp., New Haven, Conn.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Geometric Tool Co., Westville Station, New Haven 45, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

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Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
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Danly Mch. Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Detroit Die Set Corp., 2895A W. Grand Blvd., Detroit 2, Mich.
Producto Machine Co., 990 Housatonic Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

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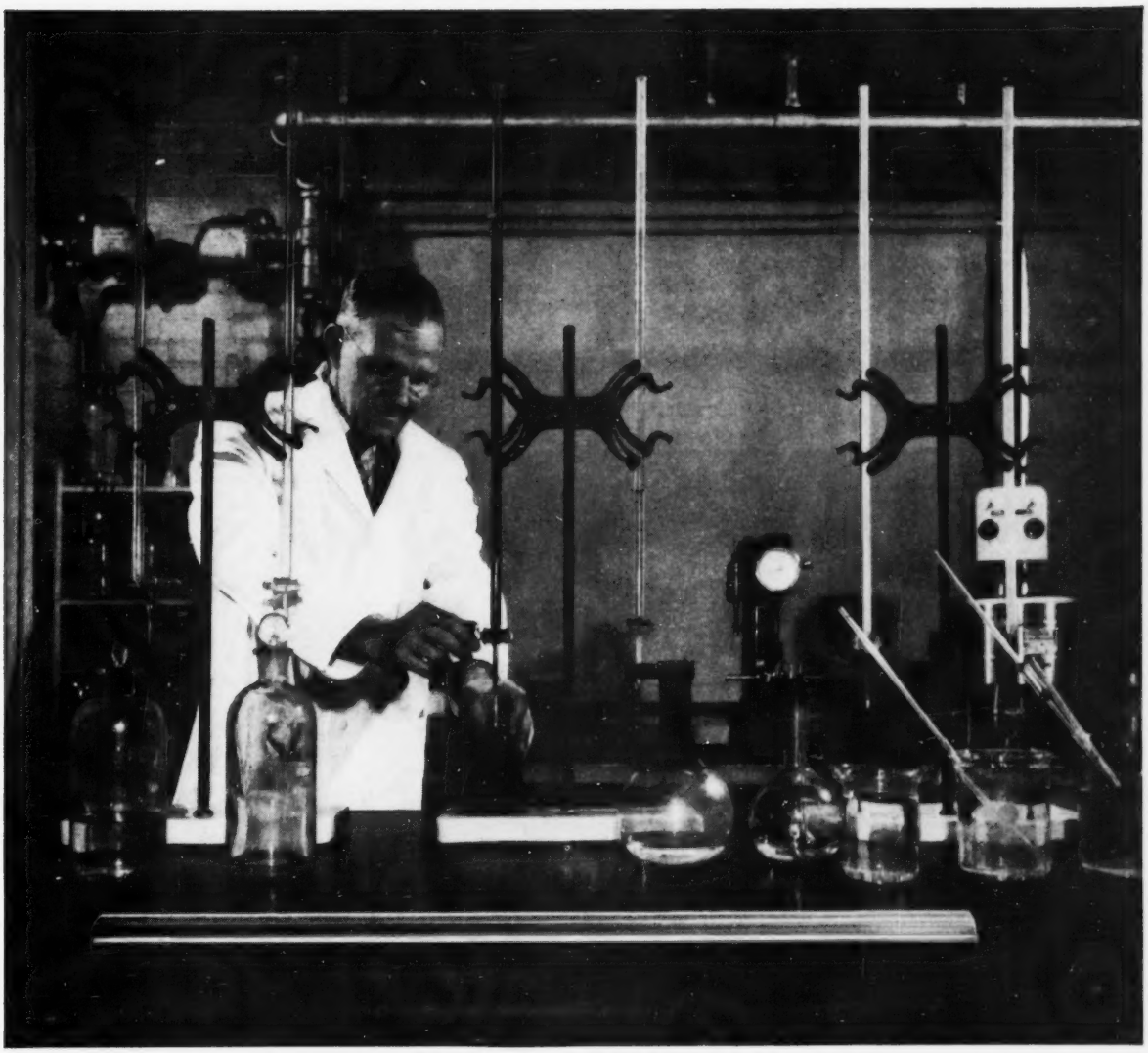
Universal Drafting Mch. Corp., 7960 Lorain Ave., Cleveland, Ohio.

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Carboloy Dept., General Electric Co., Box 237 Roosevelt Park Annex, Detroit 32, Mich.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Erickson Tools, Div. Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hoglund Engrg. & Mfg. Co., Inc., Berkeley Heights, N. J.
Metal Carbides Corp., Youngstown, Ohio.
Meyers, W. F. Co., Bedford, Ind.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn
Norton Co., 1 New Bond St., Worcester, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

(*Continued on page* 356)

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Here's how we measure the "Muscle" in an Alloy Bar

Columbia alloy bars have muscle—and plenty of it. It's the kind of uniform strength that our many customers have learned to rely on, because each alloy bar is made to the same exacting standards as the last.

Only specially selected raw material is used. This material is subjected to a continuous series of tests (like the one shown above) to verify its exact metallurgical content. What's more, each step of our production is rigorously Quality-Controlled by our laboratory to produce alloy bars that you can use in *your production* with minimum treatment and waste. ● More product information —technical assistance, too—are yours for the asking. Call or write today.



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SPECIALIZING IN COLD FINISHED STEEL BARS and SEAMLESS STEEL TUBING

the new **universal** *Burr-Master** by **MODERN**

. . . the high-speed answer to your gear burring problems!



A TRULY UNIVERSAL GEAR BURRING AND CHAMFERING MACHINE with these 8 OUTSTANDING FEATURES

*Patents Pending

1. Burrs and chamfers both spur and helical gears.
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3. Burrs and chamfers both sides and root of tooth at more than five teeth per second.
4. Two models for all popular pitch gears from ⅝ to 6½-inches pitch diameter and 3 to 9½-inches pitch diameter. Two-station models also available for added versatility.
5. Unskilled operator can change precision tooling for different parts in about 10 minutes.
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Get the answer to your gear and spline deburring and chamfering problems today. Ask for Bulletin 103-60.

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Industrial Engineering Co.

DRIFTS, DRILL

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Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL HEADS, Multiple Spindle

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Errington Mechanical Laboratory, 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit
Moline Tool Co., 102 20th St., Moline, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.
United States Drill Head Co., 616 Burns, Cincinnati, Ohio.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILL HEADS, Unit Type

Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd. Box 429, Royal Oak, Mich.
Bellows Co., 230 W. Market St., Akron, Ohio
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Keller Tool Co., Grand Haven, Mich.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Precise Products Corp., 1328 30 Clark St., Racine, Wis.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

DRILL SOCKETS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILL STANDS

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Thor Power Tool Co., Aurora, Ill.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLING MACHINES, Automatic

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., Mt. Grove St., Bridgeport, Conn.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.

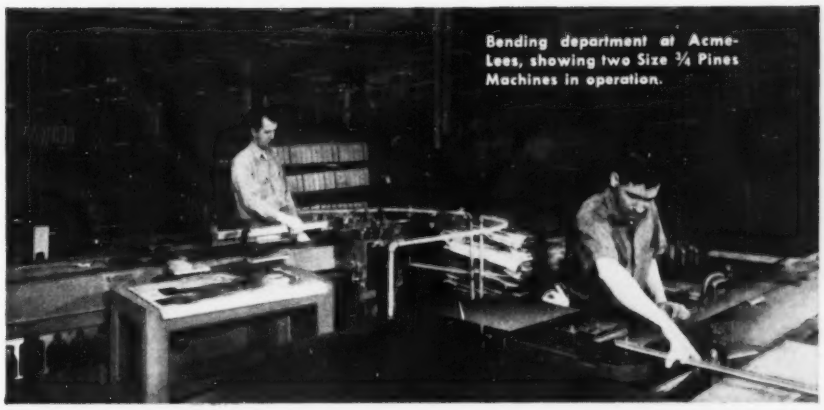
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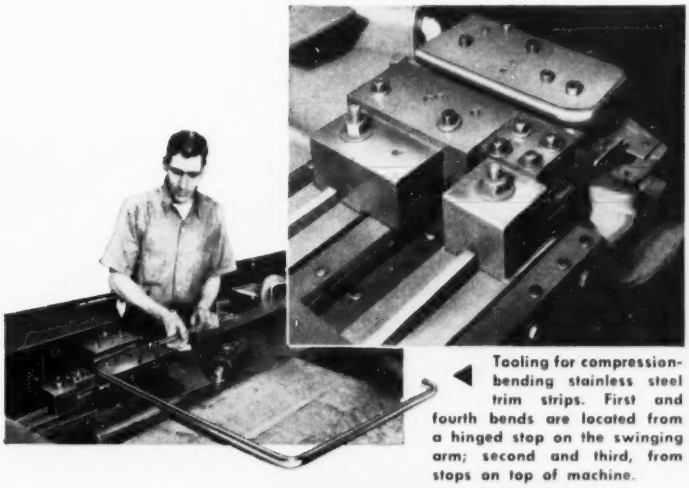
TRIM MOLDINGS PRODUCED 58% Faster

AT
ACME-LEES DIVISION
ON

PINES SIZE 3/4 AUTOMATIC BENDERS



Bending department at Acme-Lees, showing two Size ¾ Pines Machines in operation.



◀ Tooling for compression-bending stainless steel trim strips. First and fourth bends are located from a hinged stop on the swinging arm; second and third, from stops on top of machine.



◀ Tooling for draw-bending brass trim molding to 85° on a 1⅜" radius. Three different sizes of molding are handled with this same tooling by simply adjusting the distance between bends.

SKILLFUL TOOLING PRODUCES SMOOTH 1½" RADIUS BENDS IN .020" TYPE 430 STAINLESS STEEL

Here's a typical result story indicative of the bending skill of Acme-Lees Division, Muncie, Indiana, specialists in fabricating decorative trim moldings and extruded shapes for Appliance and Automotive Manufacturers. On a Size ¾ Pines Automatic Bender, .020" Type 430 stainless steel trim moldings are now formed with four unusually smooth 90° bends to a 1½" radius. Production speed is today 58% faster than by former manual bending methods. Current production is rated at 456 bends per hour as compared to 288 by manual methods.

HYDRAULIC ACTUATION REDUCES SCRAP LOSSES

As shown, the tooling is accurately machined to fit the shape of the delicate molding. A bronze wiper shoe eliminates marring the exterior finish. The operator simply positions the workpiece and starts the hydraulic clamping and bending cycle by push button. The uniform, dependable hydraulic stroke of the Pines Bender assures fast, accurate bends which reduce scrap losses and simplify assembly problems.

INVESTIGATE PRODUCTION BENDING

If you have bending work with tubing, pipe, bars, extruded or rolled shapes, it may pay you to tool for production bending the "Pines-Way". Pines engineers will work with you on any bending problem without obligation.

WRITE FOR *Free* DATA SHEETS

Write for free copies of "Pines News" — illustrate actual bending applications, give details on tooling and cost-cutting production techniques on a wide range of work.



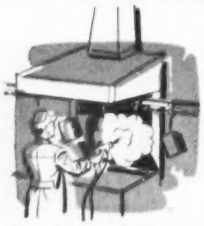
PINES ENGINEERING CO., INC.

Specialists in Tube Fabricating Machinery — 687 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

WANT TO LOWER YOUR PAINTING COSTS?

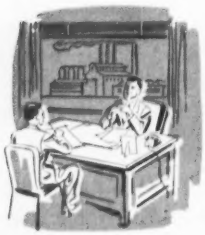
. . . and get a better paint job, too? Check the RANSBURG Processes!



Let's say you're a manufacturer of some painted product. Size and shape aren't too important. You're already using a conveyorized set-up, but you want a better quality finish . . . increased production . . . at less cost.

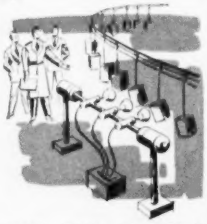
You've heard about electrostatic spray and some of the phenomenal results being achieved by Ransburg on other production lines. You write or call . . . say you want to know what Electro-Spray painting can do for YOU.





Ransburg engineers will help you investigate the possibilities. They'll gather complete data on your present operation, and check your facilities and requirements. If Electro-Spray is feasible, you will send samples of your unpainted products—with paint—to the Ransburg laboratories in Indianapolis. The labs are completely equipped, and the Ransburg engineers and technicians have every facility at their disposal for conducting extensive tests, simulating your production conditions.

After the priliminary studies and tests, you are invited to see your job run in the Ransburg Labs. There's no guesswork. You'll see the actual results. Paint and labor savings are determined. You can check the improved, uniform quality, and you'll be furnished drawings, showing the proposed installation for your own plant.



ALL OF THIS WITHOUT OBLIGATION TO YOU!



After the Electro-Spray equipment is installed, Ransburg will continue to work with your finishing department. Ransburg engineers—men skilled in electrostatic spray painting—are always available to work with you on any problem which might arise in your finishing department. Fair enough? Let us hear from you.

RANSBURG

Ransburg **ELECTRO-COATING CORP.**

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Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Machinery Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Peerless Production Corp., 19449 Glendale Ave., Detroit 23, Mich.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Bench

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

DRILLING MACHINES, Boiler

Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland.

DRILLING MACHINES, Deep Hole

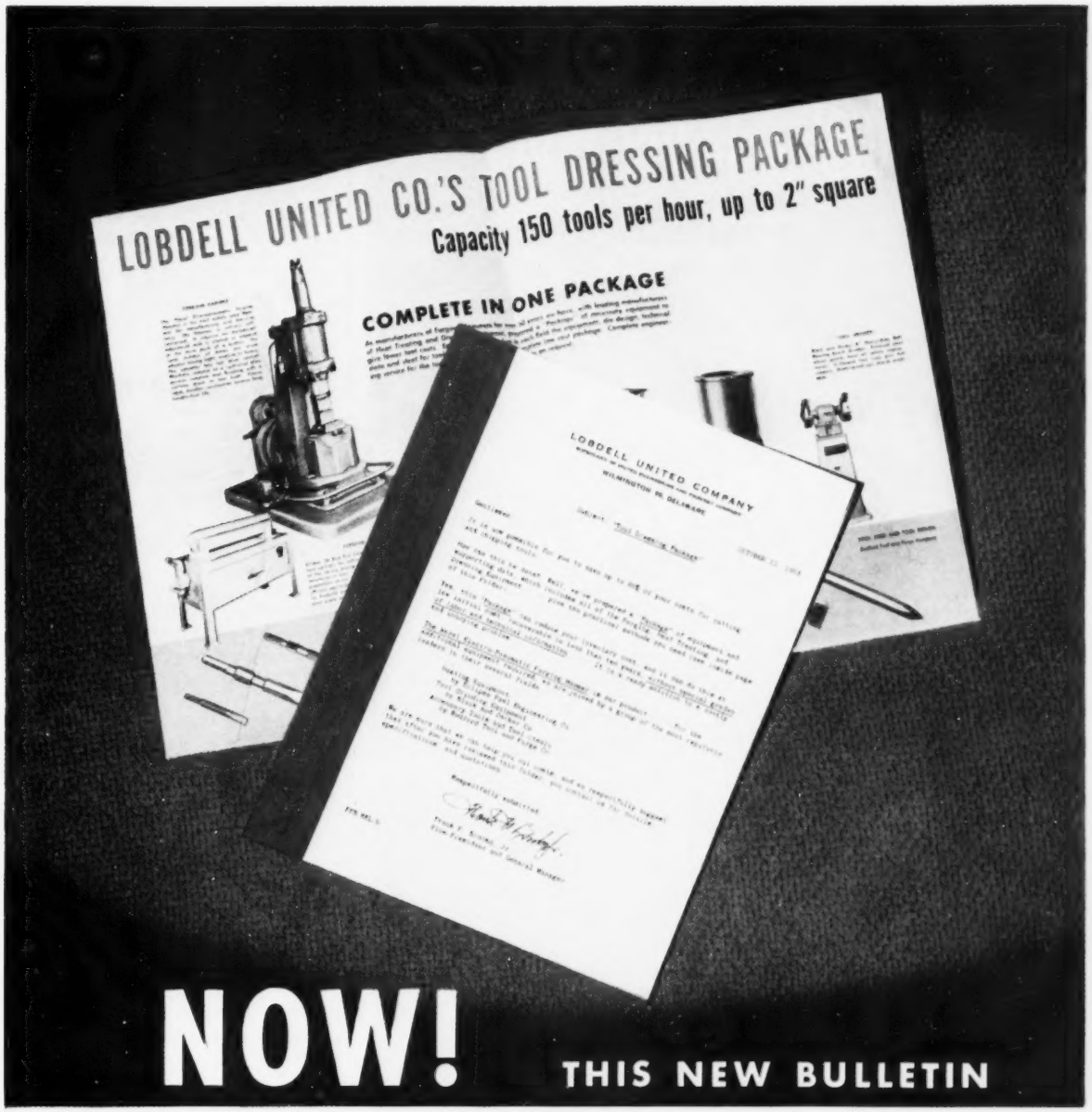
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Bellows Co., 230 W. Market St., Akron, Ohio.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
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DRILLING MACHINES, Gang

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Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K. Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.

(*Continued on page 360*)

For more information on products advertised, use Inquiry Card, page 247



TELLS ALL ABOUT
LOBDELL UNITED CO.'S "TOOL-DRESSING PACKAGE"

. . . and *now* is the time to ask for your copy of LOBDELL UNITED's new "Tool-Dressing Package" Bulletin. Why? . . . because we know that you'll be readily interested in a proposition that can save you up to 60% of your costs for cutting and chipping tools.

How is this possible? Well, we've prepared a "*Package*" of equipment and supporting data, which includes all of the Forging, Heat Treating and Dressing Equipment . . . plus the practical methods you need.

The popular NAZEL Electro-Pneumatic Forging Hammer is our product . . . for the rest of the "Package" we are joined by such outstanding firms as: Eclipse Fuel Engineering Co., the Black and Decker Co. and Bedford Tool and Forge Co. . . . But, allow us to give you the complete, money-saving facts in our "Tool-Dressing Package" Bulletin!

1836 **LOBDELL UNITED COMPANY** 1953
WILMINGTON 99, DELAWARE
A SUBSIDIARY OF UNITED ENGINEERING AND FOUNDRY COMPANY

For more information on products advertised, use Inquiry Card, page 247

...thermal sensing unit



C·P·I PLUGSTAT®

—wherever temperature limit indication is required



CPI PLUGSTATS provide precise thermal warning without calibration drift. Small physical size has been combined with rugged construction. Special alloy contacts assure clean make-and-break. Capable of 200°F overshoot from high or low normal setting. Available also with AN connector. Rated at ¼ ampere, 28 volts, AC or DC resistive loads. Contacts NO or NC. Weight approx. 1.5 oz.

Proven dependable in —
AIRCRAFT GENERATORS
AIR COOLED ENGINES
WATER COOLED ENGINES
TRUCK REAR ENDS
MARINE ENGINES
BEARINGS
PIPED LIQUIDS
GEAR BOXES

CONTROL PRODUCTS INC

320 SUSSEX STREET
HARRISON, NEW JERSEY

DRILLING MACHINES, Horiz. Duplex

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Edlund Machinery Co., Cortland, N. Y.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Kingsbury Mch. Tool Corp., Keene, N. H.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

DRILLING MACHINES, Horizontal Portable

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.

DRILLING MACHINES, Inverted

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.

DRILLING MACHINES, Multiple Center Column Type

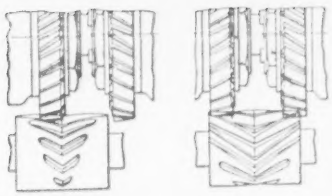
Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.

DRILLING MACHINES, Multiple Spindle

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles, Calif.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Cosa Corp., 405 Lexington Ave., New York 17.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Fanco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Greenlee Bros. & Co., 12th and Columbia Ave., Rockford, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kingsbury Mch. Tool Corp., Keene, N. H.

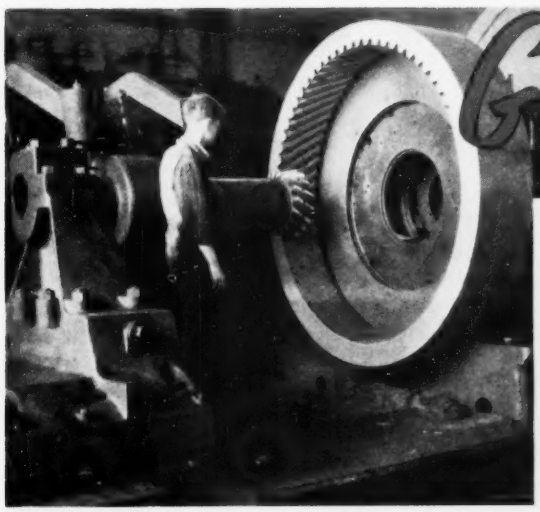
(*Continued on page 362*)

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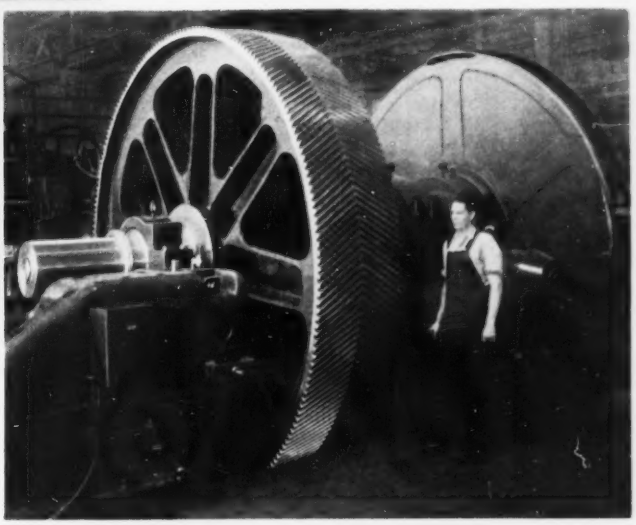


For generating double helical gears, the Farrel-Sykes machine is equipped with two cutters mounted on a single carriage. The cutters reciprocate, each ending its stroke at the center of the blank. As they cut, they twist to generate the helices and also slowly revolve in unison with the gear blank to generate the tooth contours precisely. For single helical gears one cutter is used, and for spur gears either one or two cutters may be used.

how precision gears Get Precision



Farrel-Sykes machine generating an internal single helical gear.



Generating a large herringbone gear in the Farrel-Sykes machine.

Precision comes to gears through the machine that makes them. It is passed on to Farrel® gears by the Farrel-Sykes Gear Generator, the operating principle of which (precision generation) gives the gears accurate tooth spacing, profile and helix angle. Because of this you can be sure that Farrel gears will operate smoothly, quietly and efficiently throughout a long service life.

Farrel continuous tooth herringbone gears are made in any size from ¼" to 20'0" diameter, for any power capacity and speed. Also available are straight tooth and single helical gears in sizes up to 20'0" in diameter, and large internal gears with either spur or helical teeth.

Farrel engineers will be glad to assist you in working out unusual gear problems.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Akron, Detroit, Chicago, Memphis, Minneapolis, Portland (Oregon), Los Angeles, Salt Lake City, Tulsa, Houston, New Orleans

FB-876

Farrel-Birmingham®

PRODUCTION PROVED—

OLIVER ACE

Universal Tool and Cutter Grinders

GIVE SPEED, PRECISION

and GUARANTEED ACCURACY



The *recognized* sound engineering in Oliver Ace Universal Tool and Cutter Grinder points the way to cutting costs consistently in your Toolroom. It has direct reading for clearances to ease and speed the operator's job . . . grinds the most difficult cutters easily and quickly . . . handles a wide range of cutter grinding, including high-speed and Tungsten-Carbide work, with a high degree of accuracy. The Oliver Ace Universal Tool and Cutter Grinder is backed by more than 25 years of specialization in carefully designed cutter grinding machinery . . . it has only one sliding part with ample bearing and is fully protected from dust. The Ace is dependable . . . built to last . . . simple to set up . . . easy to operate . . . faster on most grinding operations . . . requires fewer attachments than ordinary grinders.

Priced to meet your budget, the ACE excels for grinding face mills up to 15"—also, slab mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • Fellows helical cutters • reamers • taper reamers • production gashing and carbide tipped circular saws.

2 MODELS: Standard and Heavy Duty (illustrated)

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OLIVER INSTRUMENT CO.

1410 E. MAUMEE • ADRIAN, MICHIGAN

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Zagar Tool, Inc., 24000 Lakeland Blvd., Cleveland 23, Ohio.

DRILLING MACHINES, Radial

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Associated Mch. Tool Corp., P. O. Box 9666, 535 McNeilly Rd., Pittsburgh 26, Pa.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Carlton Mch. Tool Co., 3000 Spring Grove Ave., Cincinnati 25, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cincinnati Gilbert Machine Tool Co., 3366 Beekman St., Cincinnati 23, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Kaukauna Machine Corp., Kaukauna, Wis.
Modern Ind. Engrg. Co., 14230 Birwood Ave., Detroit 4, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

DRILLING MACHINES, Rail

See Drilling Machines, Gang.

DRILLING MACHINES, Sensitive

Avey Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland, 8, Ohio.
Fosdick Mch. Tool Co., 1638 Blue Rock, Cincinnati 23, Ohio.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
National Automatic Tool Co., Inc., S. 7th and N. Sts., Richmond, Ind.
Pratt & Whitney, West Hartford 1, Conn.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Upright

Avery Drilling Mch. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Mch. Tool Co., 156 Wason Ave., Springfield 7, Mass.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Canedy-Otto Div., Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio.
Cincinnati Bickford Tool Co., 3220 Forrer Ave., Cincinnati, Ohio.
Cleereman Mch. Tool Co., Green Bay, Wis.
Consolidated Mch. Tool Corp., Rochester, N. Y.

(*Continued on page* 364)

For more information on products advertised, use Inquiry Card, page 247

NEW 16" Band Saw with Speeds 50 to 4500 SFM

another Walker-Turner LIGHT-HEAVYWEIGHT to Knock Down Equipment Costs



Now, Walker-Turner brings you another *Light-Heavyweight* champ . . . another opportunity to reduce equipment costs. It's a 16" Band Saw with all the quality and efficiency features you want . . . with all the capacity and durability you need for a wide range of jobs, metal, plastic or wood. And, at a PRICE MUCH LOWER than you have ever known for any comparable machine!

Your factory-trained Walker-Turner distributor is ready to tell you about: —

* **Quick-change Variable Speed Drive.** As easily as dialing a radio, you turn the hand wheel and change blade speed smoothly, while machine runs. No need to change belts, pulleys. Speed shows on a graduated scale.

Improved Saw Guides. Upper and lower leaf type . . . adjusts to all blade widths. Ball-bearing rollers.

Carter Jiffy Tires for longer life, smoother operation.

Capacity:—Blade to frame 16 in. Upper guides to table, max. 8 in.

Other Plus Values:—New base, extra weight, new rigid frame and body design, available accesories, etc.

Get all the facts. Just phone local Walker-Turner Distributor or send coupon.

WALKER-TURNER
• DIVISION •
KEARNEY AND TRECKER CORPORATION
PLAINFIELD, N. J.

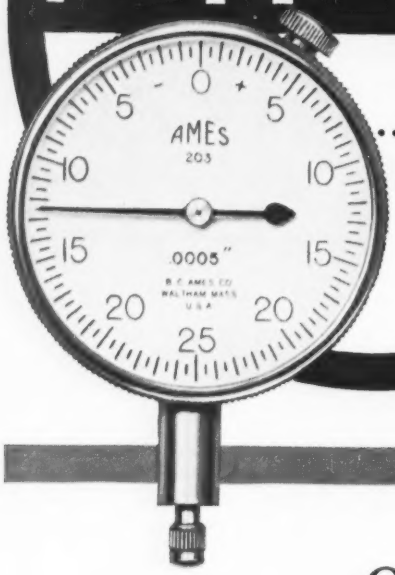
DRILL PRESSES — Hand and Power Feed • RADIAL DRILLS • Wood and Metal Cutting BAND SAWS • TILTING ARBOR SAWS • RADIAL SAWS • JIG SAWS • LATHES • SPINDLE SHAPERS • JOINTERS • BELT AND DISC SURFACERS • FLEXIBLE SHAFT MACHINES

SOLD ONLY THROUGH TRAINED INDUSTRIAL DISTRIBUTORS

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Dept. M-12, Plainfield, N. J.

AMES



...the preferred Dial Indicators

One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.



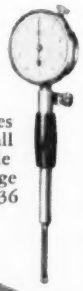
Ames Dial Depth Gauge No. 11C



Ames Dial Micrometer No. 517

Ames Amplifying Dial Comparator No. 26





Ames Small Hole Gauge No. 36



Send today for your free copy of Catalog No. 58

Representatives in principal cities. B. C. AMES CO. *27 Ames Street Waltham 54, Mass.*

Mfgr. of Micrometer Dial Gauges • Micrometer Dial Indicators

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Edlund Machinery Co., Cortland, N. Y.
Foote-Burt Co., 1300 St. Clair Ave., Cleveland 8, Ohio.
Fosdick Mch. Tool Co., 1638 Elue Rock, Cincinnati 23, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Leland Gifford Co., 1025 Southbridge St., Worcester Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Molina, Ill.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Orban Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.
Rehnberg-Jacobson Mfg. Co., 2135 Kishwaukee St., Rockford, Ill.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

DRILLING MACHINES, Wall, Radial

Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.

DRILLS, Center

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Keo Cutters, 19326 Woodward, Detroit, Mich.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Core

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Erickson Tools Div., Erickson Steel Co., 2309 Hamilton, Cleveland, Ohio.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

DRILLS, Deep Hole

Pratt & Whitney, West Hartford 1, Conn.
Smit, J. K., & Sons, Inc., Murray Hill, N. J.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

(*Continued on page* 366)

For more information on products advertised, use Inquiry Card, page 247

VIXEN Cuts
faster, freer, smoother



What's different about VIXEN FILES?

Vixen is the original and still the best. These milled curved tooth files cut freer, faster, smoother because:

1. Milled curved teeth are actually miniature milling cutters.
2. Gullets are not pointed but rounded, to make chips fall free easier.
3. Undercut teeth have distinct cutting action, do not scrape or abrade.
4. Special analysis chrome steel keeps teeth sharp longer.
5. Vixens may be resharpened many times.

ASK YOUR HELLER DISTRIBUTOR FOR COMPLETE INFORMATION

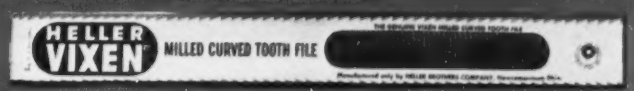
The Milled Curved Teeth of Vixen Files have deep gullets and wide pitch to prevent clogging. This eliminates tracking or serrating and leaves a scratch-free work surface. Made of special analysis chrome steel, Vixen's undercut teeth remain keen longer. Vixens are available in all types of milled curved teeth files—a *complete* line.

THESE FAMOUS FILES ARE MADE ONLY BY

American-Swiss
VIXEN
NUCUT

HELLER BROTHERS CO.
America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO

IDENTIFY VIXEN BY THE WHITE ENVELOPE



Only HELLER make the Vixen the original and still the best Milled Curved Tooth File!

HELLER BROTHERS SINCE 1836

cut your costs . . . where you cut your materials



Those who make decisions in industry really want to get a clear and unobstructed view of their cutting problems. When they do, they find great advantages in the abrasive method. Actual performance records prove that abrasive cutting with Allison job-tested wheels increases production and lowers costs.

Why not prove it to your own satisfaction? Simply get the facts and you will see why more production men turn to Allison Abrasive Cutting.



The *best* way to cut many materials . . . the *only* way to cut some.

Allison ABRASIVE CUTTING WHEELS

THE ALLISON CO., 265 ISLAND BROOK AVENUE, BRIDGEPORT, CONN.

4AL53

DRILLS, Portable Electric

Black & Decker Mfg. Co., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

DRILLS, Portable Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cieco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

DRILLS, Rachet

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap — Die Corp., Greenfield, Mass.
Morse Twist Drill &Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Twist

Besley-Welles Corp., Beloit, Wis.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRILLS, Wire

Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Rochester, Mich.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

DRIVES, Chain

Link-Belt Co., 220 S. Belmont Ave., Indianapolis 6, Ind.

DUPLICATORS

Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rickford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois, Detroit, Mich.

(*Continued on page* 368)

For more information on products advertised, use Inquiry Card, page 247

A Good Steer...



Go to G. S. for the Small Gearing You Need

Chances are G. S. can point the way . . for you . . towards an entirely new experience in Small Gear perfection *and performance!* More and more of our country's most critical users depend upon us for their requirements. For here, Fractional Horsepower Gearing is mass produced to consistently high, uniform standards of quality. You, too, can profit from the savings in time and money this better Small Gearing brings. Will you tell us just how we can best serve you now?

FRACTIONAL HORSEPOWER GEARING

GEAR

Specialties, Inc.

2635 WEST MEDILL AVENUE
CHICAGO 47, ILLINOIS

SPURS • SPIRALS • HELICALS • BEVELS • INTERNALS
WORM GEARING • RACKS • THREAD GRINDING

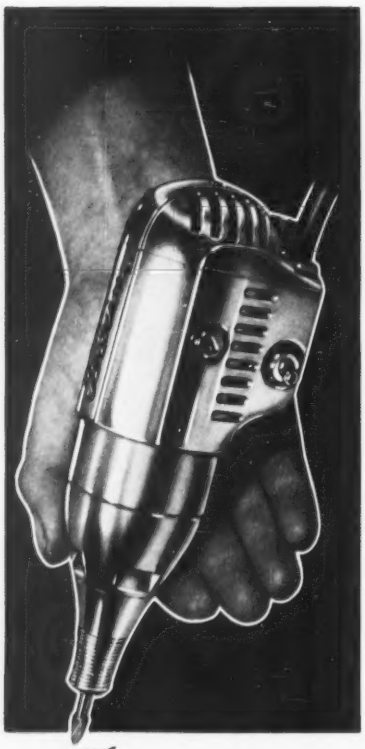
WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARING

GET OUR *Free* 6-PAGE FOLDER

See where and how we mass-manufacture Small Gearing to uniformly fine tolerances. This attractively printed 8-½ x 11" 6-page folder is punched for ring-binder use. You'll want to keep it handy for frequent reference. It contains 23 pictures of Small Gears, plant views, as well as Diametral and Circular Pitch Tables. Ask for your copy on company stationery, please!



NEW 45,000 R.P.M. AND 1/5 H. P. IN 35 OZ.



Precise

SUPER 30

OUTWORKS, OUTLASTS ANY TOOL IN ITS FIELD

Twice the power and speed in smaller size and less weight for more uses. Exclusive features include PRECISE Spindle and draw collet chuck for precision and quick, easy tool change. Operates tungsten carbide Midget Mills as efficiently as conventional rotary tools for grinding, milling, finishing, polishing and other applications on soft and hard materials including the hardest alloy steel. Micro-precision bearings have lubricant sealed in for life; AC/DC motor is air-cooled. Tool measures only 7⅜" long and tapers from 2⅛" at mounting diameter to only ½" D. at chuck nose. Unique PRECISE Mounts are available for set-ups on machine tools.



Write FOR CATALOG

PRECISE PRODUCTS CORPORATION
1338 CLARK ST. • RACINE, WIS.

DUST COLLECTORS

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
Vulcan Tool Co., 777 Lorain St., Dayton 10, Ohio.

DUST CONTROL SYSTEMS

Pangborn Corp., Hagerstown, Md.

ELECTRICAL EQUIPMENT

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

EMERY WHEEL DRESSERS

See Dressers, Grinding Wheel.

EMERY WHEELS

See Grinding Wheels.

ENGRAVING MACHINES

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.

EXTRACTORS, Screw

Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Union Twist Drill Co., Athol, Mass.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.

FACING MACHINES

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
National Automatic Tool Co., Inc., S. 7th and N Sts. Richmond, Ind.

FANS, Exhaust, Electric Ventilating

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
General Electric Co., Schenectady 5, N. Y.

FEEDS FOR PRESSES, Automatic

Bellows Co., 230 W. Market St., Akron, Ohio.
Federal Press Co., 600 Division and Big Four R. R. Elkhart, Ind.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FELT, For All Applications

American Felt Co., Glenville, Conn.

FILES, Hack

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Hand

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Heller Bros. Co., Newcomerstown, Ohio.
Nicholson File Co., 23 Acorn St., Providence, R. I.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.

FILES, Machine

Atkins Saw Div., Borg-Warner Corp., 402 South Illinois St., Indianapolis 9, Ind.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILES AND BURS, Rotary

Atrax Co., Newington, Conn.
Jarvis, Chas. L., Co., Middletown, Conn.
Peck, Stow & Wilcox Co., Southington, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Thor Power Tool Co., Aurora, Ill.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FILING MACHINES, Dies, Etc.

DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Grob Bros., Grafton, Wis.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.

FILTERS, Air

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Keller Tool Co., Grand Haven, Mich.

FILTERS, Coolant and Oil

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Cuno Engrg. Corp., Meriden, Conn.

FINISHES FOR MACHINES AND METAL PARTS

Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

FLEXIBLE COUPLINGS

See Couplings, Flexible.

FLEXIBLE SHAFT EQUIPMENT

Jarvis, Chas. L., Co., Middletown, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

FORGINGS, Hollow Bored

Ajax Mfg. Co., Euclid, Cleveland 17, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

FORGINGS, Drop

Bethlehem Steel Co., Bethlehem, Pa.

FORGINGS, Hollow Bored

Bethlehem Steel Co., Bethlehem, Pa.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

FORGINGS, Iron and Steel

Bethlehem Steel Co., Bethlehem, Pa.
Cameron Iron Works, Inc., 1000 Silber Rd., Houston, Texas.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Morgan Engrg. Co., Alliance, Ohio.
National Forge & Ordnance Co., Irvine, Warren County, Pa.

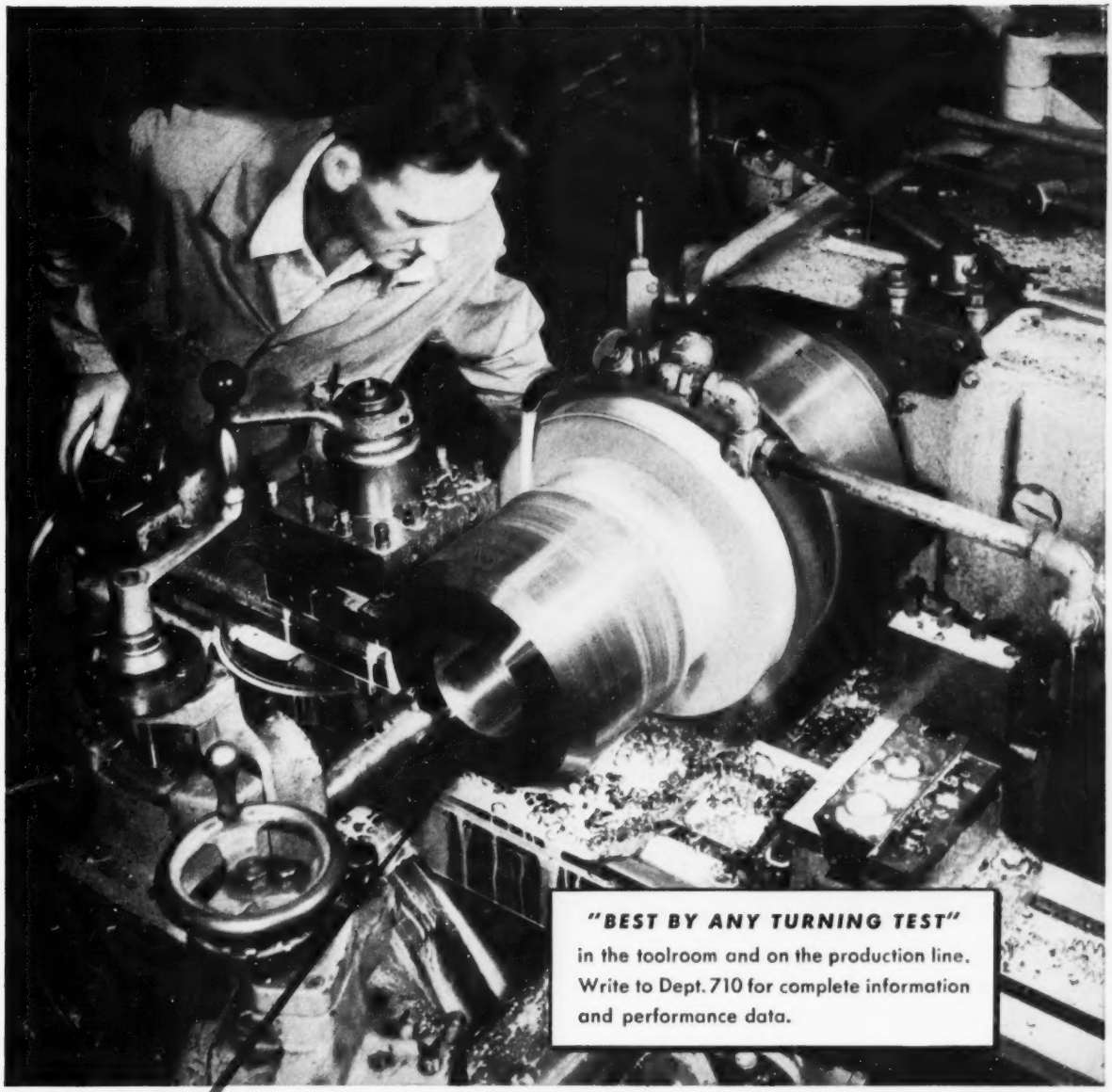
FORGINGS, Upset

Bethlehem Steel Co., Bethlehem, Pa.

FORMING AND BENDING MACHINES

American Steel Foundries, Elmes Engrg. Div., Paddock Rd., and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Bath, Cyril, Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif. (Stretch-Wrap).
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Peck, Stow & Wilcox Co., Southington, Conn.
Yoder Co., 5500 Walworth, Cleveland, Ohio.

(*Continued on page 370*)



Jones & Lamson turret lathes are BUILT and POWERED TO PRODUCE

MORE CHIPS
MORE PIECES
MORE PROFIT

per tool
per hour
per job . . . than any turret lathe of comparable size!

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 512 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L TURRET LATHE DIV.

For more information on products advertised, use Inquiry Card, page 247

FORMING AND STAMPING MACHINES

Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

FORMING TOOLS or Tool Blanks

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Brown & Sharpe Mfg. Co., Providence, R. I.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

FRAMES, Machinery Welded

Mahon, R. H. Co., Detroit 34, Mich.

FURNACES, Heat-Treating

General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

FURNITURE, Shop

Standard Pressed Steel Co., Jenkintown, Pa.
Western Tool & Mfg. Co., 1640 E. Wheeler St., Springfield, Ohio.

GAGE BLOCKS

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

GAGES, Air

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Comparator

Ames, B. C., Co., Waltham 54, Mass.
Comtor Co., 47 Farwell St., Waltham 54, Mass.
Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth

Ames, B. C., Co., (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Hanson-Whitney Co., Div., Whitney Chain Co., Hartford, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Electric

Cosa Corp., 405 Lexington Ave., New York 17.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GAGES, Height

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Plug, Ring and Snap

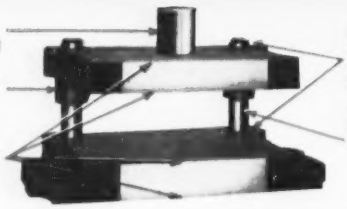
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.

(*Continued on page 372*)

YOU PAY FOR THE BEST . . .
BE SURE YOU GET THE BEST

FACTORY-BUILT IS BETTER-BUILT

When you specify "Detroit" die sets, you are assured micro-metric precision that means: 1) Lower costs in mounting die in die set and 2) Longer, trouble-free production runs. Factory-built die sets give you what you pay for—parallelism, squareness and finish.



Factory-built to the most exacting standards, "Detroit" die sets are also factory-assembled and factory-inspected. You don't have to re-work "Detroit" die sets in your shop to get the accuracy and performance you have a right to expect.

For prompt factory delivery, call "Detroit"

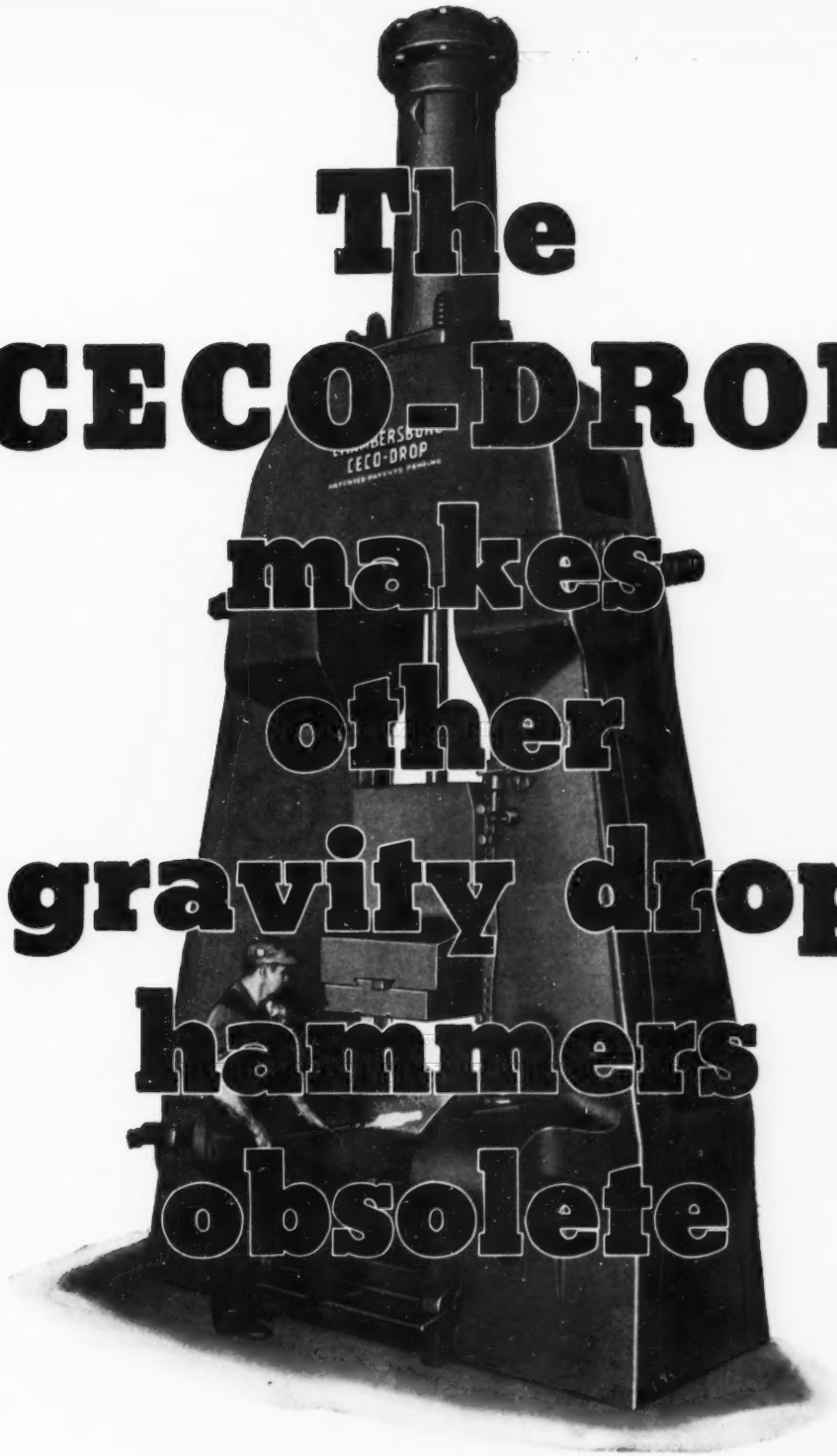
DETROIT	TR 2-5150	MINNEAPOLIS	PR 1822
BIRMINGHAM, ALA.	3-1341	MONTREAL, CAN.	WI 1186
BUFFALO	CI 0163	NASHVILLE	6-2597
CHICAGO	PU 5-7694	NEWARK	MA 2-4318
CINCINNATI	HU 7775	PHILADELPHIA	VI 4-4084
CLEVELAND	TO 1-0860	PITTSBURGH	LO 1-4011
DALLAS	TE 3818	ROCK ISLAND, ILL.	RI. 8-2814
DAYTON	HE 3042	ST. LOUIS	FR 6811
INDIANAPOLIS	HU 5604	SEATTLE	SE 7997
LOS ANGELES	AD 7251	TOLEDO	MA 4510
MILWAUKEE	GL 3-7170	TORONTO, CAN.	KE 2972

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICH.

DETROIT DIE SET ★

For more information on products advertised, use Inquiry Card, page 247

The CECO-DROP makes other gravity drop hammers obsolete



Builders of THE IMPACTER

"FORGING IN MID-AIR"

CHAMBERSBURG ENGINEERING CO., CHAMBERSBURG, PA.

Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York.
Kennametal, Inc., Latrobe, Pa.
Metal Carbides Corp., Youngstown, Pa.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Turner Bros. Inc., 2625 Hilton Rd., Ferndale 20, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Vinco Corp., 9113 Schaefer Hwy., Detroit 28, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GAGES, Surface

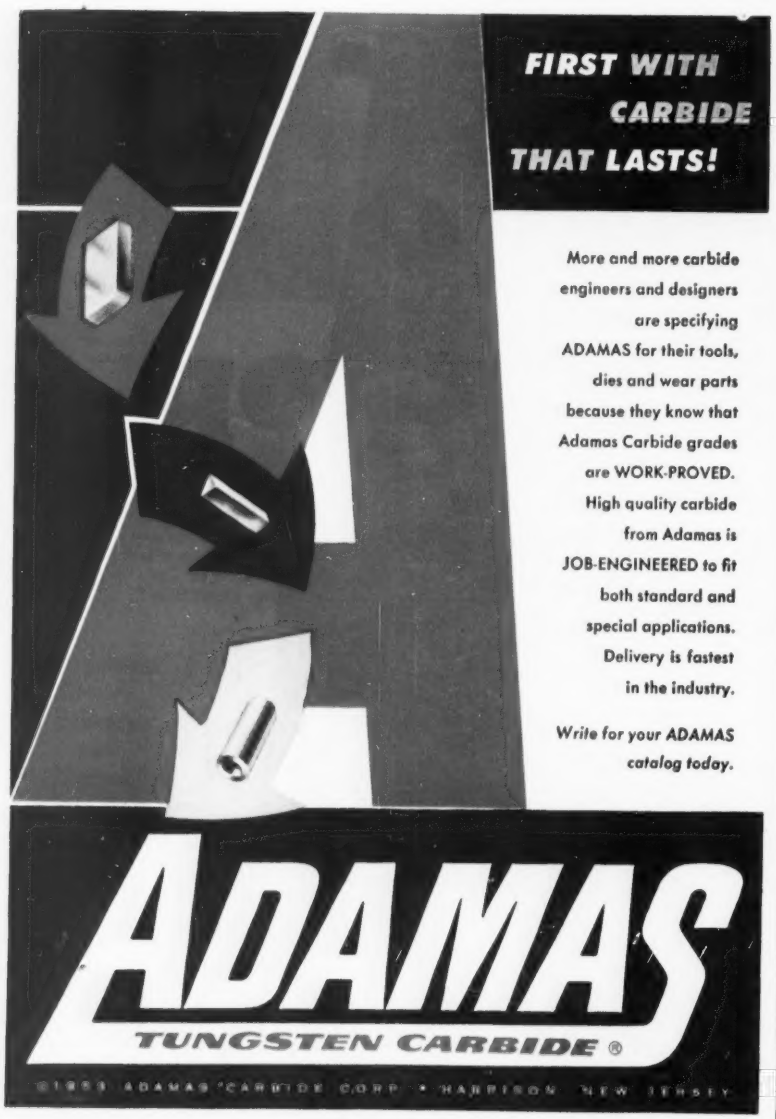
Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpes Mfg. Co., Providence, R. I.
Columbus Die-Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.

GAGES, Taper

Brown & Sharpe Mfg. Co., Providence, R. I.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Thread

Axelson Mfg. Co., P. O. Box 19335, Vernon Sta., Los Angeles 58, Calif.



Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GASKETS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.

GEAR BLANKS, Non-Metallic

Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
General Electric Co., Schenectady 5, N. Y.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GEAR BURNISHING MACHINES

Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHAMFERING, ROUNDING AND BURRING MACHINES

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Modern Industrial Engrg. Co., 14230 Birwood, Detroit 4, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

GEAR CHECKING INSTRUMENTS AND EQUIPMENT

Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

GEAR CUTTING MACHINES, Bevel Gears (Generators)

Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES Bevel Gears, Spiral

Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Bevel Gears (Rotary Cutter)

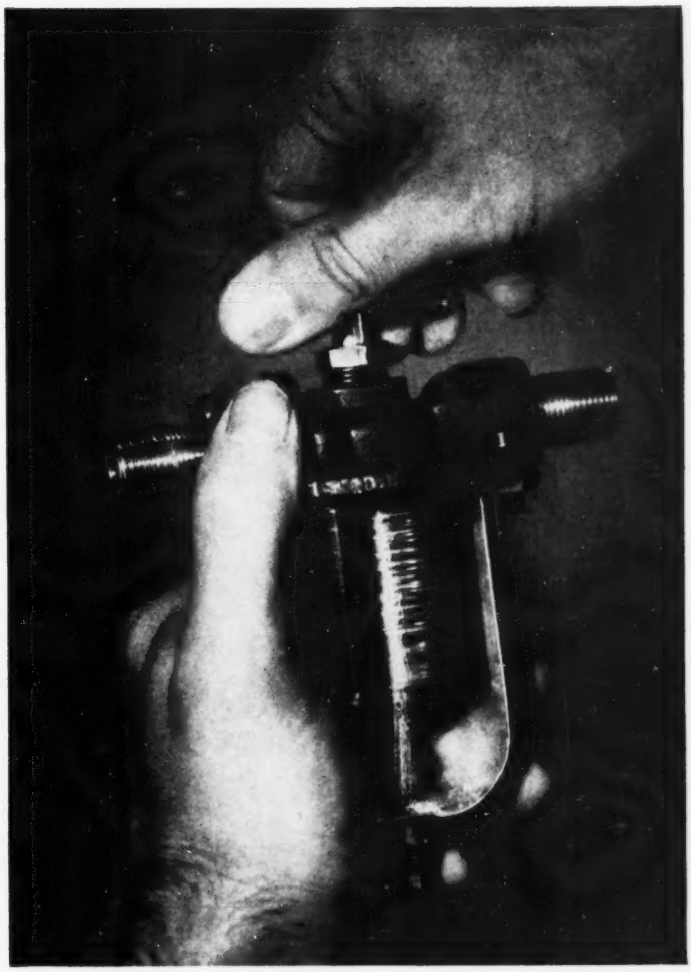
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Waltham Machine Works, Newton St., Waltham, Mass.

GEAR CUTTING MACHINES, Spur and Helical Gears (Hobbing)

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.

(*Continued on page* 374)

For more information on products advertised, use Inquiry Card, page 247



JUST A twist OF THE wrist

That's all it takes to clean the Cuno AUTO-KLEAN—the strainer that can be continuously cleaned while it's working.

Turning the handle one revolution moves the strainer element through comb blades, removing all dirt from strainer surfaces. Dirt particles fall to bottom of housing, where they can be drained off periodically. Cuno's exclusive combing operation cleans thoroughly—without costly interruption of fluid flow.

- AUTO-KLEAN's permanent metal filter element is available in steel, brass or stainless steel for long trouble-free service under any conditions.
- AUTO-KLEAN is adaptable to any fluid-flow system.
- From acids to tar . . . if you can pump it, Cuno can filter it. Capacities range from one gallon per hour to 3,800 gallons per minute.

A 3.8

CUNO

ENGINEERED FILTRATION

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (disc-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound)

HERE'S HOW TO GET LOW-COST FILTRATION OF INDUSTRIAL FLUIDS

Continuously cleanable AUTO-KLEAN eliminates need for stand-by strainers

You don't need to use a duplex strainer system to get the solids out of your coolants, chemicals, water, lube oils or hydraulic fluids. Chances are a *single* Cuno AUTO-KLEAN strainer will do the job.

This is possible because you don't have to shut down your fluid-flow system to clean this strainer. Cuno's exclusive "comb-clean" action provides complete cleaning of the strainer element on the job—*without stopping fluid flow*. Thus you get non-stop filtration, with no need for a stand-by strainer.

AUTO-KLEAN saves on maintenance bills, for it isn't necessary to disassemble the filter in order to clean the cartridge. An occasional rotation of the handle does a thorough cleaning job. (Most units can be equipped with motor-drives for continuous cleaning.)

AUTO-KLEAN's low pressure drop permits full-flow service on gravity or low pressure lines, with no loss in operating efficiency.

AUTO-KLEAN's fixed-space metal discs will stop all solids larger than the specified disc spacing—from .0035" (170 mesh) to .062" (12 mesh).

Send coupon today for free AUTO-KLEAN bulletin.

A.3.13

Cuno Engineering Corporation
Dept. 1313A South Vine St., Meriden, Conn.

Please send me bulletin on Cuno AUTO-KLEAN

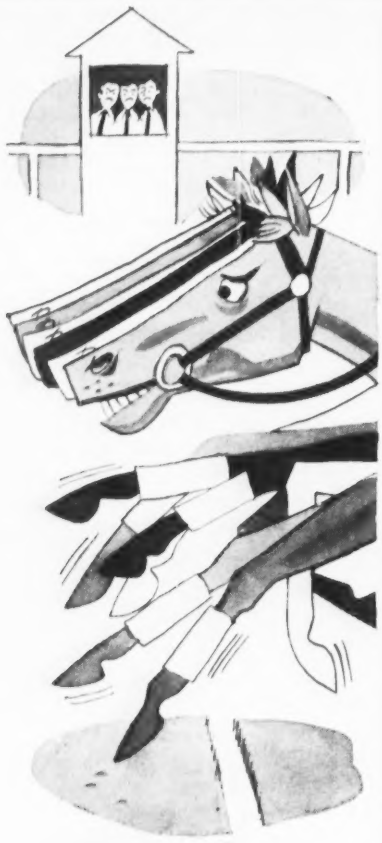
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City.....Zone....State.....



need a better finish?

Torrington Swaging Machines – delivering 4000 hammer blows a minute – work out surface imperfections quickly... produce a finish far superior to that obtained by other reduction methods. Swaging improves the quality of the material, too, and utilizes every ounce of stock.



"The Torrington Swaging Machine" describes all the advantages of swaging and gives full details on all Torrington machines. A copy is yours for the asking.

THE TORRINGTON COMPANY
Swager Department
558 Field Street • Torrington, Conn.
Makers of
TORRINGTON NEEDLE BEARINGS

Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR CUTTING MACHINES, Spur and Helical Gears (Shaper or Planer Type)
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.

GEAR CUTTING MACHINES, Worm and Worm Wheels
Barber-Colman Co., Rock and Montague, Rockford, Ill.
Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt. (Straight and Hourglass Types).
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEAR FINISHING MACHINES
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR GRINDING MACHINES
Cosa Corp., 405 Lexington Ave., New York 17.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Van Norman Co., Springfield, Mass.

GEAR HARDENING MACHINES
Gleason Works, 1000 University Ave., Rochester 3, N. Y.

GEAR LAPPING MACHINES
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR MOTORS
See Speed Reducers.

GEAR SHAVING MACHINES
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.

GEAR TESTING MACHINERY
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Brown & Sharpe Mfg. Co., Providence, R. I.
Eastman Kodak Co., Rochester, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
National Broach & Mch. Co., 5600 St. Jean Ave., Detroit 2, Mich.
National Tool Co., 11200 Madison Ave., Cleveland, Ohio.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

GEARS, CUT
Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Automotive Gear Works, Inc., Richmond, Ind.

(Continued on page 376)

Cutting by hand?



Cutting by power?



Cutting with bandsaws?



your VICTOR **DISTRIBUTOR** has the **RIGHT BLADE**

For over half a century, quality has made VICTOR Blades the blades industry prefers – for hand, power or bandsaw work, for the tough jobs as well as the easy ones.

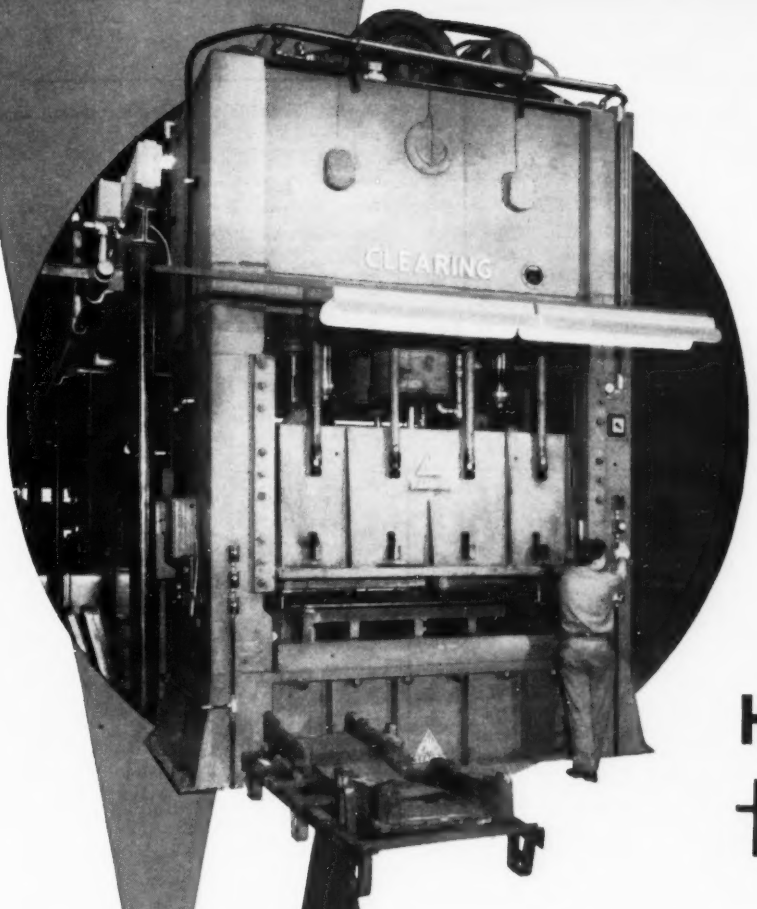
Wherever you are, you can get fast, local service from your VICTOR Distributor's stocks–and he's thoroughly qualified to recommend the *right* blade to solve your cutting problems.

Buy all you can from your Industrial Distributor–he's the man who's closest to your needs, not only for VICTOR Blades, but for hundreds of products you need regularly. 3098

Sold Only Through Recognized Distributors.

VICTOR
SAW WORKS, INC. • MIDDLETOWN, N. Y., U. S. A.
Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

For more information on products advertised, use Inquiry Card, page 247



This closeup of the die area shows a refrigerator door on a Clearing 400 ton straight side press.

CLEARING PRESSES

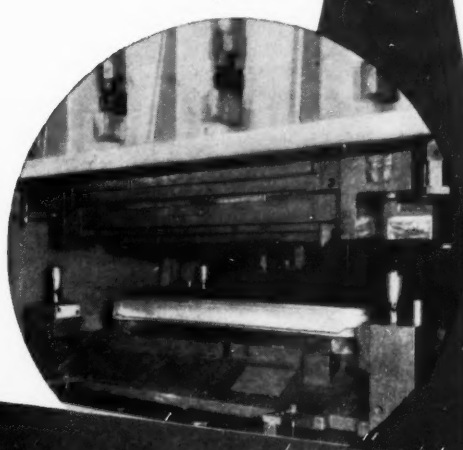
Head the Line at Hotpoint

When a company sweeps into production on the scale of Hotpoint's new refrigerator plant, heavy emphasis is placed on quality control. Responsibility for accuracy looms as important as efficient production.

The Clearing presses standing at the very beginning of the entire process assume much of this burden. At this point dependability and accuracy of press operation affects subsequent finishing and assembly operations.

This is the kind of service these presses were designed and built for—the kind of service they perform in hundreds of installations throughout the country. So if you plan to renew or expand production facilities, take a tip from the masters of mass production, call on Clearing Machine Corporation.

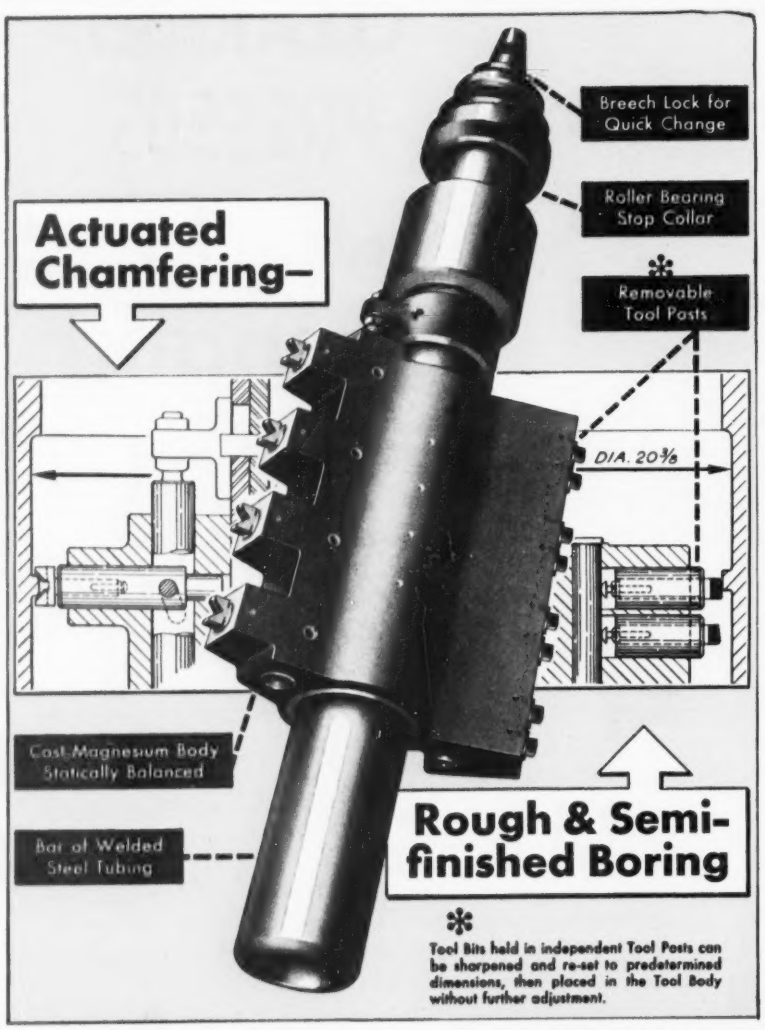
THE WAY TO EFFICIENT MASS PRODUCTION



CLEARING PRESSES

CLEARING MACH[illegible] St., Chicago 38, Illinois • HAMILTON DIVISION, Hamilton, Ohio

Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bilgram Gear & Mch. Works, 1217-35 Spring Garden St., Philadelphia, Pa.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Brad Foote Gear Works, 1309 S. Cicero Ave., Cicero 50, Ill.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Cleveland Worm & Gear Co., 3249 E. 80th St., Cleveland, Ohio.
Cone-Drive Gears Div., Michigan Tool Co., 7200 E. McNichols Rd., Detroit, Mich.
Diefendorf Gear Corp., 920 N. Belden Ave., Syracuse, N. Y.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Franke Gear Works, Inc., 1924 W. Columbia Ave., Chicago 26, Ill.
Gear Specialties Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Illinois Gear & Mch. Co., 2120 No. Natchez Ave., Chicago 35, Ill.
Mass. Gear & Tool Co., 36 Nassau St., Woburn, Mass.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
New Jersey Gear & Mfg. Co., 1470 Chestnut Ave., Hillside, N. J.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Perkins Mch. & Gear Co., Box 1611, Springfield 2, Mass.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia Pa.
Pittsburgh Gear Co., 2700 Smallman St., Pittsburgh, Pa.
Sier-Bath Gear & Pump Co., Inc., 9248 Hudson Blvd., North Bergen, N. J.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.



TOOLING by GAIRING

Few of you will recognize the operation pictured here. Part of our defense effort, its exact nature cannot be divulged • All of you, however, will agree that the engineering and manufacturing skill to make tools of such apparent complexity and size — and to make them successfully — should put GAIRING into first place for consideration whenever you require special tooling of any description • May we ask our nearest representative to call?

The GAIRING TOOL COMPANY • 21225 Hoover Road • Detroit 32, Michigan

In Canada: A. C. Wickman (Canada) Ltd., Queensway, Toronto 14.

GEARS, Rawhide and Non-Metallic

Amgears, Inc., 6633 W. 65th St., Chicago 38.
Atlantic Gear Works, Inc., 200 Lafayette St., New York 12, N. Y.
Boston Gear Works, 3200 Main St., North Quincy, Mass.
Braun Gear Co., 239 Richmond, Brooklyn 8, N. Y.
Cincinnati Gear Co., Wooster Pike and Mariemont Ave., Cincinnati, Ohio.
Diefendorf Gear Corp., 920 N. Beldon Ave., Syracuse, N. Y.
Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Harrford, Conn.
Ohio Gear Co., 1333 E. 179th St., Cleveland.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.
Pittsburgh Gear Co., 2700 Smallman St., Pittsburgh, Pa.
Stahl Gear & Mch. Co., 3901 Hamilton Ave., Cleveland 14, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.
Williamson Gear & Machine Co., 2606 Martha St., Philadelphia 25, Pa.

GENERATORS, Electric

General Electric Co., Schenectady 5, N. Y.
Lincoln Electric Co. (Arc), 22801 St. Clair Ave., Cleveland, Ohio.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

GRADUATING MACHINES

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.

GREASE

Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 129 Lockwood St., Newark 5, N. J.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

GRINDERS, Carbide Tool

See Grinding Mches, Carbide Tool

GRINDERS, Centerless

Van Norman Co., Springfield, Mass.

GRINDERS, Die and Mold

Consolidated Mch. Tool Corp., Rochester, N.Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

GRINDERS, Oilstone, for Woodworking Tools

Mummert-Dixon Co., Hanover, Pa.

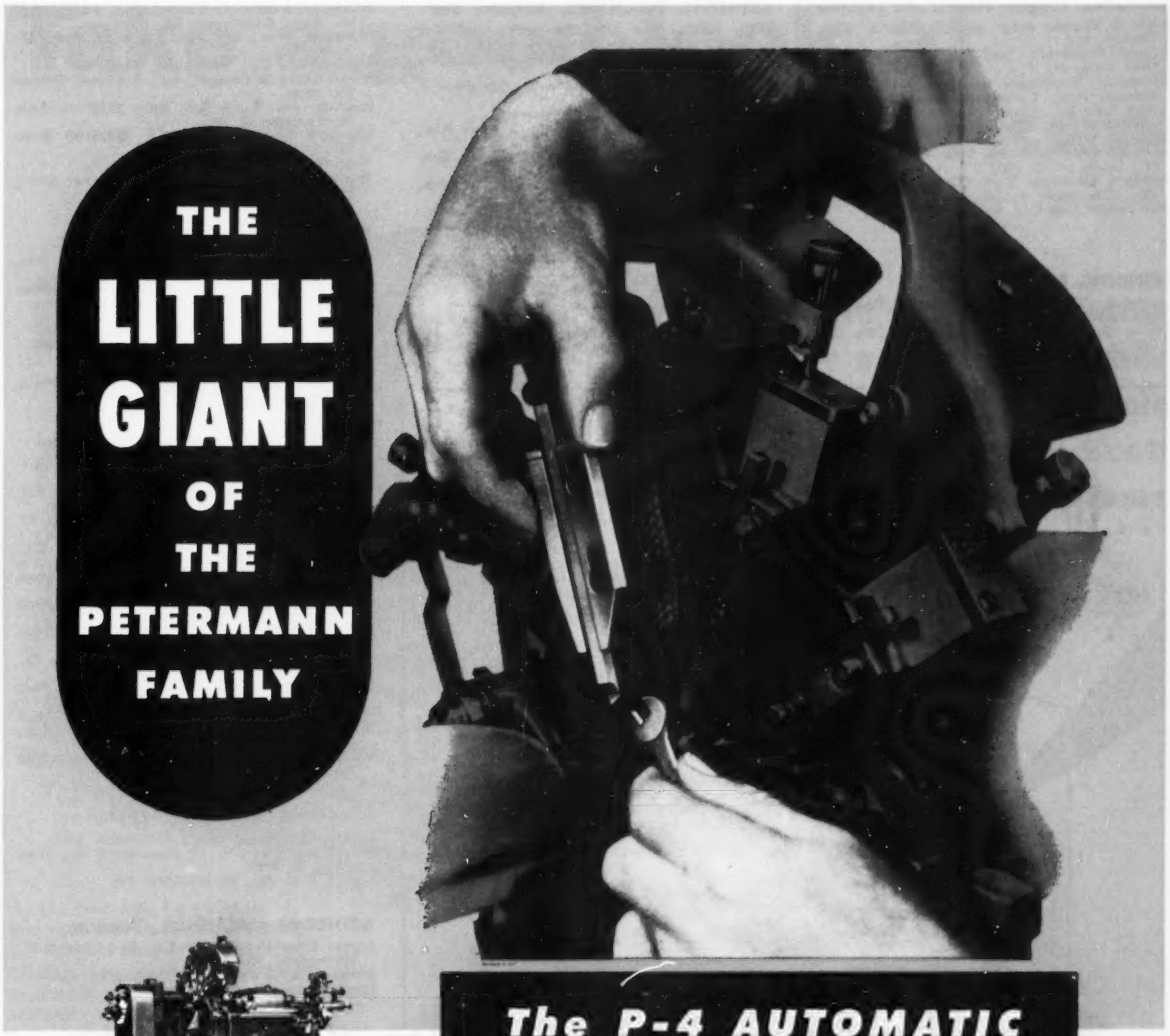
GRINDERS, Pneumatic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Ingersoll-Rand Co., Phillipsburg, N. J.
Keller Tool Co., Grand Haven, Conn.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Thor Power Tool Co., Aurora, Ill.

(*Continued on page* 378)

For more information on products advertised, use Inquiry Card, page 247

THE LITTLE GIANT OF THE PETERMANN FAMILY



The P-4 AUTOMATIC



For work within its capacity (pieces 5/32" in diameter and 1½" long) we offer a machine of deadly accuracy and high production . . . 10 speeds to 12,000 RPM.

On this page we can show only *one* of the P-4's salient advantages . . . the ability to remove a tool for sharpening without removing it from the tool holder . . . *and grinding in place.*

The many other advantages are described in Catalog sent on request.

RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.

GRINDERS, Portable Electric and Toolpost

Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Millers Falls Co., Greenfield, Mass.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.

GRINDING FIXTURES

Geometric Tool Co. (Die Chaser), Westville Station, New Haven 15, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GRINDING MACHINES, Abrasive Belt

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Mattison Mch. Works, Rockford, Ill.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.
Walls Sales Corp., 333 Nassau Ave., Brooklyn 22, N. Y.

GRINDING MACHINES, Bench

Besly-Welles Corp., Beloit, Wis.
Black & Decker Mfg. Co., E. Penna. Ave., Towson, Md.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gorton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
Millers Falls Co., Greenfield, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

GRINDING MACHINES, Broach

Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Lapointe Mch. Tool Co., 34 Tower St., Hudson, Mass.

GRINDING MACHINES, Camshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Carbide Tool

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 N. Laurel Ave., Des Plaines, Ill.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

GRINDING MACHINES, Centerless

Cincinnati Grinders, Inc., Cincinnati, Ohio.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Chucking

Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Bullard Co., Brewster St., Bridgeport, Conn.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Crankshaft

Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.

GRINDING MACHINES, Cylindrical

Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Landis Tool Co., Inc., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Van Norman Co., 2640 Main St., Springfield 7, Mass.

GRINDER MACHINES, Die Chaser

Eastern Mch. Screw Corp., New Haven, Conn.
Landis Machine Co., Waynesboro, Pa.

GRINDING MACHINES, Disc

Besly-Welles Corp., Beloit, Wis.
Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

(*Continued on page* 380)



For more information on products advertised, use Inquiry Card, page 247

Take a good look at this worker–

He's demonstrating why so many key men are already sold on new Scott Industrial Wipers



At the tool crib, he picks up his box of Scott Industrial Wipers . . . keeps it next to his machine all day long. Each Scott Wiper is double-ply, strong, and absorbent—designed for the entire range of industrial wiping

Because they are disposable, Scott Wipers set new standards of sanitation—help eliminate the causes of dermatitis



Each Scott Wiper is of uniform size, color and absorbency. This means, at last, you can eliminate the hidden costs of wiping operations and organize wiping in the same manner as other production operations.

Many plants have found a 90-day trial—with a Scott representative working hand in hand with their supervisory personnel—the most accurate way of measuring the advantages of Scott Industrial Wipers.

If you would like such a trial period in your plant, simply contact your local Scott representative or write Dept. MB, Scott Paper Company, Chester, Pennsylvania, for details.

SCOTT PAPER COMPANY

GRINDING MACHINES, Drill

Blake, Edward Co., 442 Cherry St., West Newton 65, Mass.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, Face

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Besly-Welles Corp., Beloit, Wis.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Mattison Machine Works, Rockford, Ill.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

GRINDING MACHINES, Flexible Shaft

See Flexible Shaft Equipment

GRINDING MACHINES, Gap

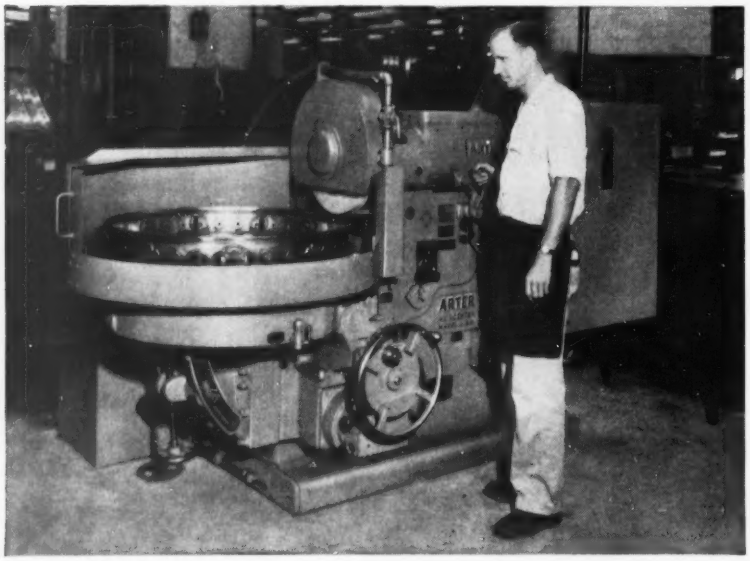
Cincinnati Grinders, Inc., Cincinnati, Ohio.
Landis Tool Co., Waynesboro, Pa.

GRINDING MACHINES, Gear Tooth

See Gear Grinding Machines

ARTER *Precision*

ROTARY SURFACE GRINDERS



ARTER MODEL B 40″ ROTARY SURFACE GRINDER grinding an important part for the latest jet engine. Flat, parallel surfaces are required. ARTER has been building Surface Grinders for work requiring the utmost precision for flatness, size and finish for more than thirty years.

ARTER ROTARY SURFACE GRINDERS are made in sizes from 8″ to 40″ chuck capacity.

Write today for complete details and specifications

Arter GRINDING MACHINE CO.

WORCESTER 5, MASSACHUSETTS

Rotary Surface Grinders, Cylindrical Grinders, Flat Circular Cutter Grinders, Internal Grinders, Carbide Tool Grinders

GRINDING MACHINES For Sharpening Cutters, Reamers, Hobs, Etc.

Barber-Colman Co., Rock and Montague, Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mch. Co., Cincinnati, Ohio.
Cosa Copr., 405 Lexington Ave., New York 17, N. Y.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gailmeyer & Livingston Co., 336 Straight Ave., S. W. Grand Rapids 4, Mich.
Gleason Works, 1000 University Ave., Rochester 3, N. Y.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Landis Tool Co., Waynesboro, Pa.
land, Ohio.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Union Twist Drill Co., Athol, Mass.

GRINDING MACHINES, For Sharpening Turning and Planing Tools

Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Oliver Instrument Co., 1410 E. Maumee St., Adrian, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Walker, O. S., Co., Inc., Worcester, Mass.
Waltham Machine Works, Newton St., Waltham, Mass.

GRINDING MACHINES, Internal

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass.
Bryant Chucking Grinder Co., 257 Clinton St., Springfield, Vt.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, 32, Mich.
Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Wicaco Machine Corp., Stenton Ave. and Louden St., Philadelphi,a Pa.

GRINDING MACHINES, Jig

Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Moore Special Tool Co., Inc., 724 Union Ave., Bridgeport, Conn.
Pratt & Whitney, West Hartford 1, Conn.

GRINDING MACHINES, Knife and Shear Blade

Abrasive Mch. Tool Co., Dexter Rd., E. Providence 14, R. I.
Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Hill Acme Co., 1201 W. 65th St., Cleveland 2,
Mattison Machine Works, Rockford, Ill.
United States Electrical Tool Div., Emerson Elec. Mfg. Co., 1050 Findlay St., Cincinnati 14, Ohio.

(*Continued on page 382*)

For more information on products advertised, use Inquiry Card, page 247

MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK

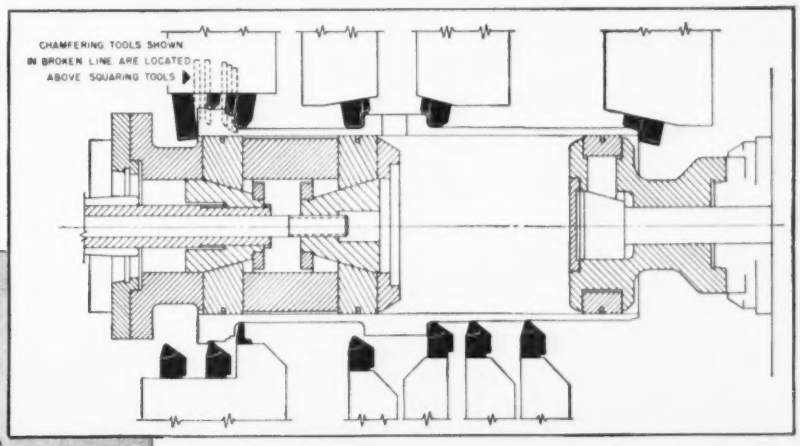
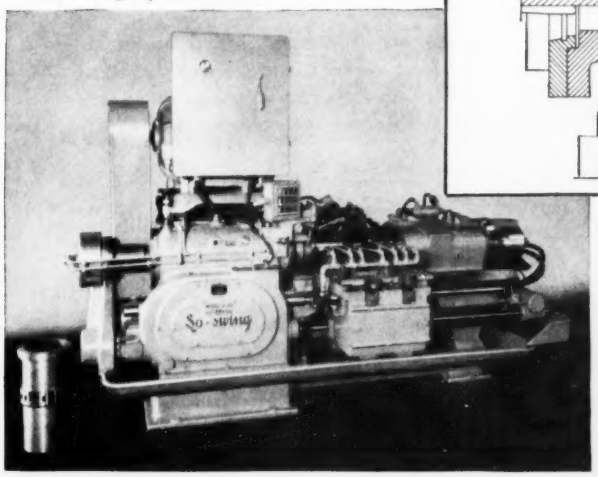


Fig. 1. Details of arbor construction and location of 22 cutting tools.

Fig. 2. Model R-18 Lo-swing Lathe equipped for machining large cylinder liners.



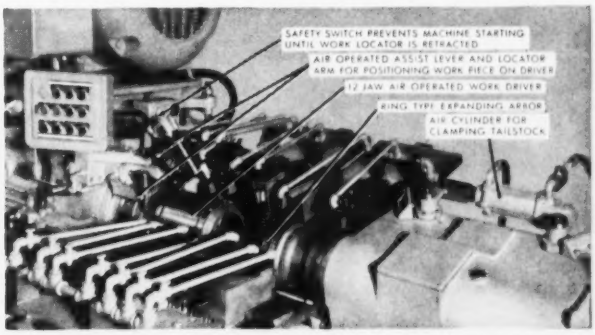


Fig. 3. Close-up view of special tooling and tailstock.

MODEL R-18 AUTOMATIC *Lo-swing* LATHE MACHINES LARGE CYLINDER LINERS AT FAST PACE

Problem: To turn outside diameters, face shoulders and chamfer large cylinder liners 11-1/2" diameter by 22" long.

Solution: The large swing Model R-18 Automatic Lo-swing Lathes selected for this job were equipped with special tailstocks and tooling engineered for this particular job.

The work is held and driven by a special driver, mounted on the headstock spindle, which has two rows of six, air-operated driving jaws. Each row is operated by its individual pull bar (Fig. 1) thus equalizing the air pressure on both sets of jaws. In order to avoid distortion and provide increased support, both sets of jaws grasp the work piece where the wall thickness is greatest.

The relieving type tailstock has a 20 inch stroke, operated by a motorized lead screw, permitting easy removal of the cylinder sleeves from the long driver. Its large revolving spindle is fitted with an air-operated, ring type expanding arbor which supports the work at the tailstock end.

The work is located in relation to the ports previously cut around the liner body by a locator arm (Fig. 3) which enters one of the ports when swung downwards. The operator then positions the piece on the driving arbor with an air-operated assist lever which holds it tight against the locator until the driving jaws grasp it. A safety switch above the locator arm prevents the machine being started with locator in engaged position.

A 60 HP motor drives the machine. Floor to floor time is 5.2 minutes, demonstrating the substantial economies possible with Lo-swing methods. Let Seneca Falls engineers assist with your turning problems.

PRODUCTION COSTS ARE LOWER WITH *Lo-swing*

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Gardner Machine Co., 414 E. Gardner St., Beloit, Wis.
Heald Machine Co., 10 New Bond St., Worcester 6, Mass.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.

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Cosa Corp., 405 Lexington Ave., New York 17.
Ex-Cello-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

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Frauenthal Div., Kaydon Engineering Corp., Muskegon, Mich.
Landis Tool Co., Waynesboro, Pa.
Van Norman Co., Springfield, Mass.

GRINDING MACHINES, Radius, Link

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Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

GRINDING MACHINES, Ring Wheel

Besly-Welles Corp., Beloit, Wis.
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Mattison Machine Works, Rockford, Ill.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.



self releasing
precision
expanding
mandrels

.0005" ACCURACY GUARANTEED

• ERICKSON PRECISION EXPANDING MANDRELS provide the ideal means of gripping on interior surfaces. With them, close tolerance machining or checking operations can be accomplished with exceptional speed.

The mandrel sleeve, alternately slotted from each end, expands and grips along its entire length . . . accommodates variations over 1/32" range.

A single mandrel shank is usable with an entire series of sleeves and can handle an enormous variety of work.

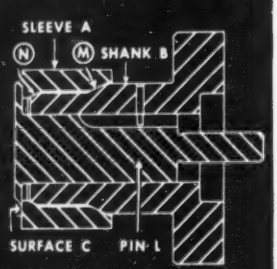
Besides the illustrated standard models, multiple sleeve and other special designs can be adapted to meet specific job requirements.

Sleeves can be machined to fit splines, undercuts, threads, and other internal contours.

A-7610

the inside story...

Sleeve "A" is automatically lined up concentrically with the axis of shank "B" by the sleeve's cam surfaces "M" and "N". These mate with the cam surfaces of the shank to within .0001". Sleeve "A" is open slotted at both ends. When pin "L" is drawn back against surface "C", sleeve "A" expands equally over its entire length. Release of this force instantly relieves the mandrel's grip. Some models use locknuts to expand the sleeve instead of the drawpin in the diagramed design.



ERICKSON PRECISION HOLDING TOOLS INCLUDE: Collet Chucks, Floating Holders, Air Chucks, Tap Chucks, and Speed Indexers.

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Van Norman Co., Springfield, Mass.

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Arter Grinding Mch. Co., 15 Sagamore Rd., Worcester 5, Mass. (Rotary)
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Columbia Machinery & Engrg. Corp., Hamilton 1, Ohio.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
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Gardner Machine Co., 414 E. Gardner St. Beloit, Wis.
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Mattison Machine Works, Rockford, Ill.
Norton Co., 1 New Bond St., Worcester 6, Mass.
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Pratt & Whitney, West Hartford 1, Conn.
Reid Bros. Co., Inc., Beverly, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Thompson Grinder Co., 1500 W. Main St., Springfield, Ohio.
Thor Power Tool Co., Aurora, Ill.
Walker, O. S., Co., Inc., Worcester, Mass.

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Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.

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Landis Machine Co. (Centerless), Waynesboro, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
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Sheffield Corp., 721 Springfield, Dayton, Ohio.

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Landis Tool Co., Waynesboro, Pa.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Orban, Kurt Co., Inc., 205 East 42nd St., New York 17, N. Y.

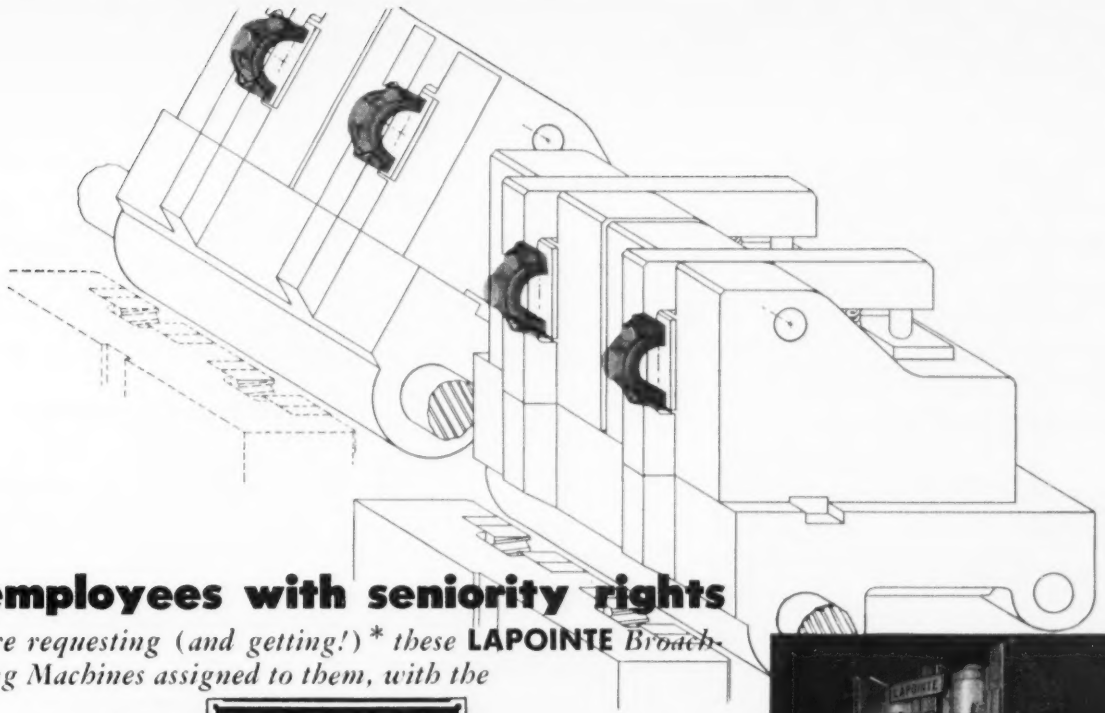
GRINDING MACHINES, Worm

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Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.
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(*Continued on page* 384)



employees with seniority rights

are requesting (and getting!) these* **LAPOINTE** *Broaching Machines assigned to them, with the*

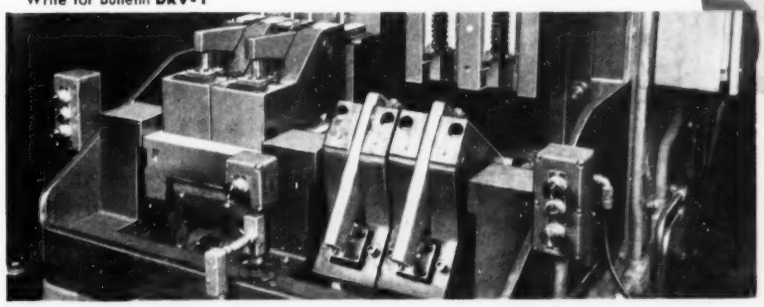
exclusive **LAPOINTE**
DOUBLE TIP-DOWN FIXTURE

why? *Because they have found these machines so convenient for part handling!*

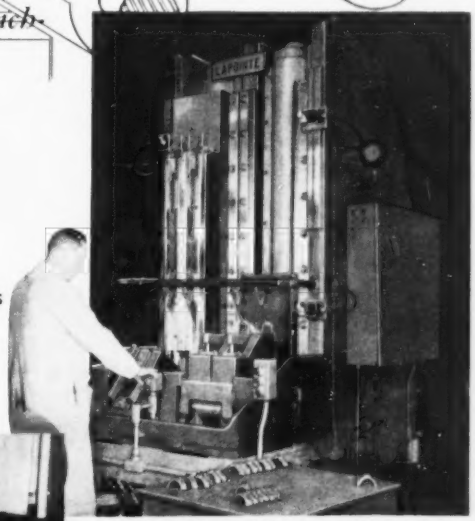
Here are the reasons: *Fixture tilts down toward the operator*

. . . for safe and convenient handling of parts
. . . in the most natural position
. . . into inclined, unobstructed work nests
. . . already visible and easily accessible *without reaching across the machine!*

Write for Bulletin **DRV-1**



The **LAPOINTE** Double Tip-Down Fixture operates hydraulically and is electrically interlocked in synchronism with the travel of the broach assemblies, cutting on one ram while the other ram is being loaded.



Straddle broaching the sides of **Automotive Connecting Rod Cap,** removing a maximum of 1/8" of stock per surface from the forging . . . with the **LAPOINTE** 10-ton, 42-inch stroke Double Ram Vertical Surface Broaching Machine. With this machine, even a green operator who had never before run a machine was able to produce 750 parts per hour!

*An actual case! (Name on request.)

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HOISTS, Electric

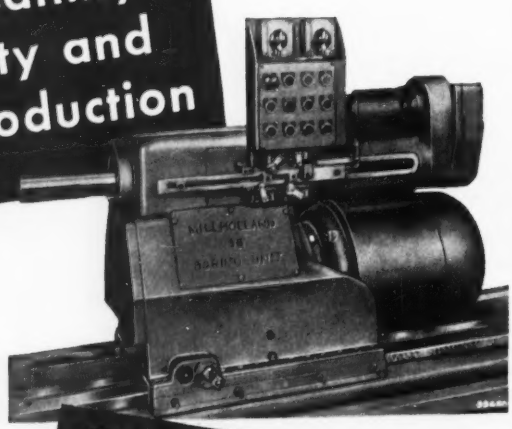
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(*Continued on page* 386)

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MILLHOLLAND'S *New* AUTOMATIC BORING UNIT

Here's a new fixed center Horizontal Boring Mill unit that quickly gives you toolroom accuracy and production speeds—plus versatility!

Specially designed for short and medium run jobs, a single Millholland Automatic Boring Unit can be used for a variety of jobs, and one or more units can be mounted on a bed to perform a wide range of operations. Automatic operation replaces manual lever shifts, giving a complete automatic feed cycle. Hydraulic feeds are infinitely adjustable.

The body is heavily proportioned throughout for maximum rigidity. The hardened steel alloy spindle reciprocates thru hardened steel bushings mounted in the sleeve. The sleeve is contained in two precision Timken bearings.

SPECIFICATIONS

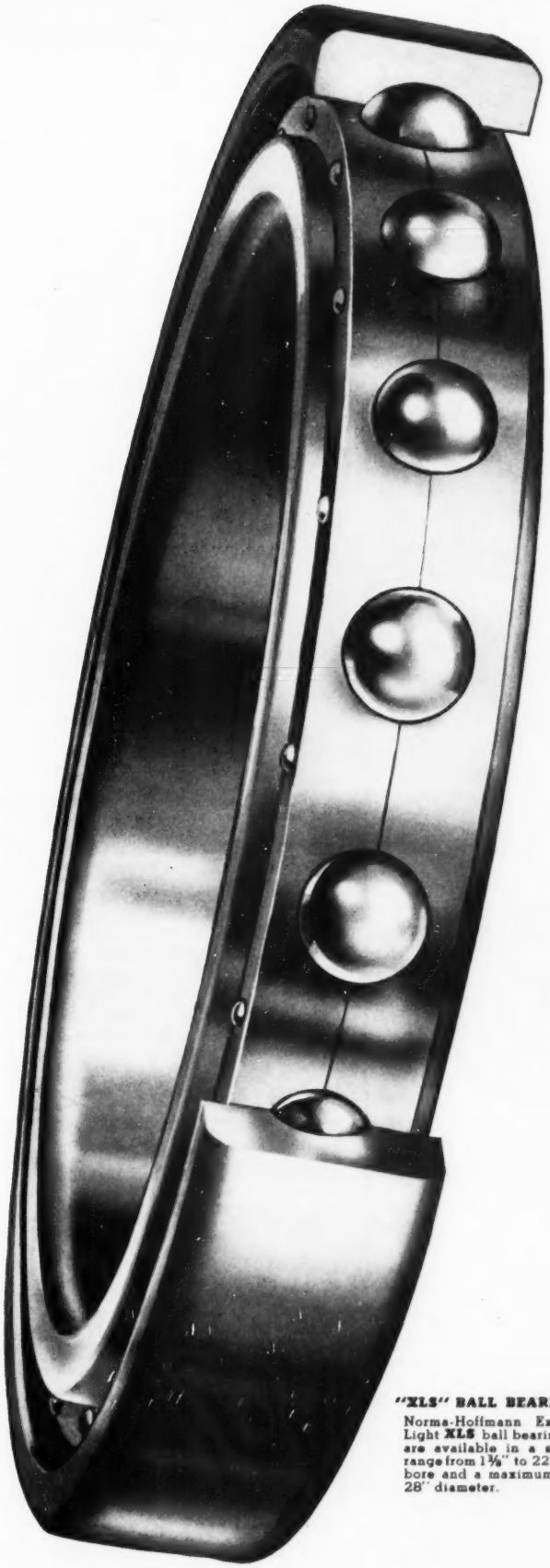
Horsepower	5 to 10	Diameter of spindle	3"
Spindle speeds by pick-off gears	33 to 500 rpm	Morse taper of spindle	No. 5
		Length of stroke	10"

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Get more information about this new Millholland Automatic Boring Unit. Let us show you how efficiently they can be applied to many of your horizontal boring mill operations.

W. K. MILLHOLLAND MACHINERY COMPANY, INC.
6402 WESTFIELD BLVD.
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Barnes W. F. & John Co., 201 S. Waterford St., Rockford, Ill.
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Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead , Ohio.
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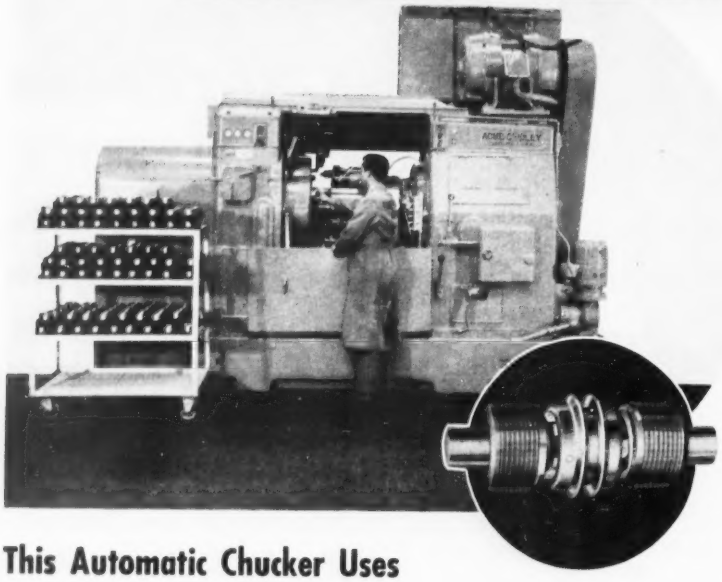
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(*Continued on page* 388)

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This Automatic Chucker Uses Fast Speeds and Heavy Feeds

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Shows typical installations of ROCKFORD CLUTCHES and POWER TAKE-OFFS. Contains diagrams of unique applications. Furnishes capacity tables, dimensions and complete specifications.

B-W

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410 Catherine Street, Rockford, Illinois, U.S.A.

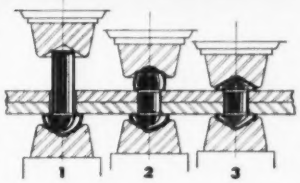
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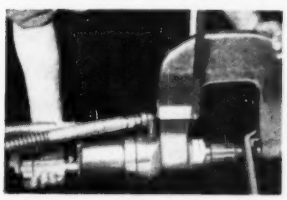
WHY HANNIFIN "HY-POWER" RIVETERS SAVE YOU MONEY

STRONGER JOINTS!

This "silent squeeze" method gives you (1) rapid advance to riveting position, (2) high-pressure shaping of the rivet, cold or hot, and (3) automatic reversal as soon as the rivet is formed. Why are these rivets stronger? Because with this method the rivet shank expands to completely fill the hole and, as the metal flows to shape the heads, fillets are formed under both heads. The rivet is work-hardened, too, and every rivet is uniform.



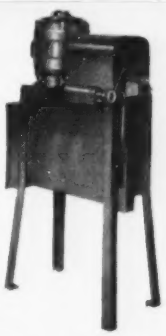
FASTER RIVETING!



Yes! From the time the button is touched it takes only 2½ seconds to head a ⅜" rivet. *"Hy-Power" is safe, too!* For the stroke can be interrupted and the ram reversed automatically anywhere in the cycle, simply by releasing the control button.

QUIETER OPERATION!

Here's the power source for this modern riveting method . . . it's the Hannifin "Hy-Power" Generator. This compact unit is a combination of motor, pump, oil reservoir, automatic control valves and high pressure intensifier that quietly supplies hydraulic pressure to...





...your "Hy-Power" cylinders—available in 7½, 10, 12½, 17½, 25, 35, 50, 75 and 100-ton capacities (more in multiple). Cylinders can either be mounted in yokes (portable or stationary) or installed in machines of your design.

GET THE FACTS!

Get Bulletin 150. Learn why cost-conscious firms in many fields use "Hy-Power." Just write for your copy of this 32-page book. We'll mail it promptly.



HANNIFIN

Hannifin Corporation, 1109 S. Kilbourn Ave., Chicago 24, Illinois

Air and Hydraulic Cylinders • Hydraulic Presses • Pneumatic Presses • "Hy-Power" Hydraulics • Air Control Valves

For more information on products advertised, use Inquiry Card page 247

INDICATORS, Test

Ames, B. C. Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Standard Gage Co., Inc., Poughkeepsie, N. Y.
Starrett, The L. S., Co., Athol, Mass.

INDUCTION HEATING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Ohio Crankshaft Co., 3800 Harvard Ave., Cleveland, Ohio.

INSPECTION INSTRUMENTS, Visual

American Cystoscope Makers, Inc., 1241 Lafayette Ave., New York, N. Y.

INTENSIFIERS, Hydraulic

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Baldwin-Lima-Hamilton Corp., Philadelphia 42.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

JACKS, Planer

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Northwestern Tool & Engrg. Co., 117 Hollier Dayton, Ohio.

JIG BORER

See Boring Machines, Jig.

JIGS AND FIXTURES

Allied Products Corp., 12677 Burt Rd., Detroit 23, Mich.
Bath, Cyril Co., 6984 Machinery Ave., Cleveland 3, Ohio.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Columbus Die, Tool & Mch. Co., 955 Cleveland Ave., Columbus, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Ingersoll Milling Machine Co., 2442 Douglas St., Rockford, Ill.
Jahn, B., Manufacturing Co., Ellis St., New Britain, Conn.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Northwestern Tool & Engrg. Co., 117 Hollier Dayton Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsacket, R. I.

JOINTS

See Fittings, Hydraulic, Pneumatic, Etc.

KEYSEATERS

Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Consolidated Mch. Tool Co., Rochester, N. Y.
Davis Keyseater Co., 405 Exchange St., Rochester 8, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Mitts & Merrill, 68 Holden St., Saginow Mich.
Morton Mfg. Co., Muskegon Heights, Mich.

KNURL HOLDERS

Brown & Sharpe Mfg. Co., Providence, R. I.
Pratt & Whitney, West Hartford 1, Conn.

KNURLING TOOLS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago Ill.
Pratt & Whitney, West Hartford 1, Conn.

LAPPING MACHINES

Barnes Drill Co. (Straight Line or Rotating,) 814 Chestnut St., Rockford, Ill.
Cincinnati Grinders, Inc. (Centerless), Cincinnati, Ohio.
Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill. (Lapmaster Div.).
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Gleason Works, 1000 University Ave., Rochester, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Micromatic Hone Corp., 8100 Schoolcraft, Detroit 4, Mich.
Norton Co., 1 New Bond St., Worcester 6, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

LAPPING PLATES, Hand

Crane Packing Co., 1800 Cuyler Ave., Chicago.

LATHE AND GRINDING DOGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

LATHE ATTACHMENTS

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hendey Machine Co., Inc., Torrington, Conn.
Jones & Lamson Mch., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(*Continued on page 390*)

SHELDON
CHICAGO U. S. A.





OFTEN PAYS OUT ON THE FIRST JOB...

and gives additional years of "cost free" service.

In the past, lathes were generally bought as large and as heavy as possible to insure accuracy and sufficient power. Now, with accurate, low-cost Sheldon Precision lathes, it is more profitable to buy these faster, cost-cutting lathes for the specific job at hand just as you would buy jigs and fixtures.

In savings of tooling costs, operator cost, power cost, and plant loading, as well as extra profits from more pieces per hour, Sheldon lathes often pay back their cost on a single run.

Sheldon lathes will work to the closest tolerances—have "Zero Precision" Taper Roller Bearings. They can take a healthy cut when operating at high speed direct drive—have double V-belts to the spindle. They will swing 10", 11" or 13" and have a 1⅝" hole through the spindle—have sufficient capacity for the great bulk of lathe work. Sheldon lathes have created a new factor for figuring machinery costs. They are tools you should know about.

Write for Catalog

SHELDON MACHINE CO., INC.

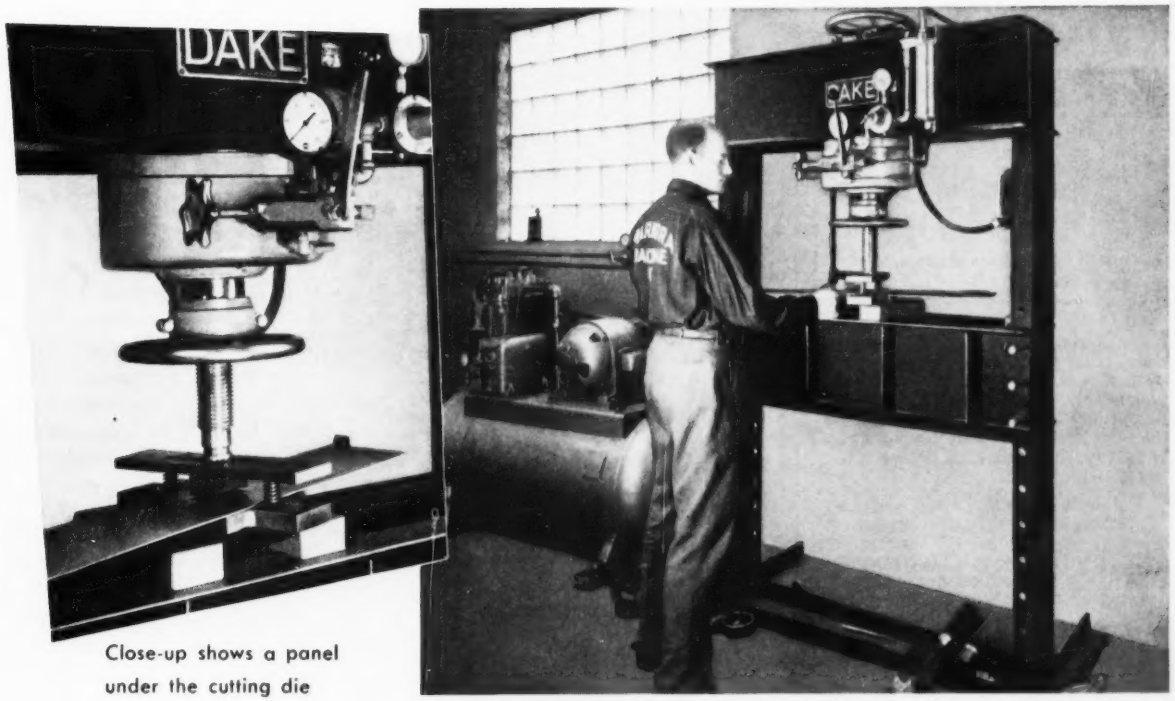
4246 N. Knox Ave. Chicago 41, Illinois

For more information on products advertised, use Inquiry Card, page 247

OCT. 2 MILLER

Used his head, a $100 die, and a DAKE Hydraulic Press

to reduce cost of cutting job from 88¢ to 9¢ a panel



Close-up shows a panel under the cutting die

Jerry Denicola of the Marmora Machine Co., Chicago, believes in using his head to make money. The ways in which he uses his Dake Press should be an inspiration to other machinists.

One of his customers makes flame-cutting machines, for which Jerry furnishes steel panels in which an opening must be cut exactly 1¾" x 2¾".

This job was formerly end-milled, and the corners filed square—a job that required a skilled mechanic. Fifty panels cut this way required 7½ hours' labor at $2.35 an hour, $17.62 for the run, or 88¢ a panel.

So Jerry made a hardened die at a cost of about $100, and put the job on his Dake Press. Now a run of 50 panels can be cut in 3 hours by a semiskilled mechanic at a cost of $1.50 an hour—$4.50 for the run, or only 9¢ a panel. So every time an order for fifty more panels recurs, there's an extra profit of $13.12 in it!

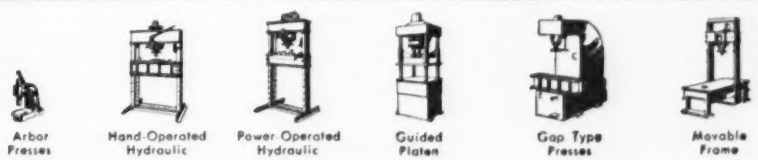
You, too, can make an extra profit with a Dake Press... see your Dake distributor.

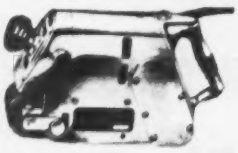


Write for This Catalog

Dake Engine Company, 604 Seventh St., Grand Haven, Mich.

DAKE PRESSES





"WE HEARTILY RECOMMEND LUBRIPLATE LUBRICANTS"

—says PORTER-CABLE MACHINE CO., Leading mfrs. of portable electric tools

"LUBRIPLATE reduces drag, permits easy starting, quiet operation and protects our machine parts against progressive wear. LUBRIPLATE is initially applied to our tools at the factory. For future lubrication by users, we secure LUBRIPLATE packed in tubes for distribution through our dealers."

For nearest LUBRIPLATE distributor, see Classified Telephone Directory. Send for free 56-page "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.



Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sidney Machine Tool Co., Sidney, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHE CONVERTER

Master Mfg. Co., Hutchinson, Kansas.

LATHES, Automatic

Bullard Co., Brewster St., Bridgeport 2, Conn.
Cone Automatic Mch. Co., Inc., Windsor, Vt.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Goss & DeLeeuw Mch. Co., Kensington, Conn.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St. Sidney, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
New Britain Mch. Co., New Britain-Gridley Mch. Div., New Britain, Conn.
Porter-Cable Machine Co., Salina St., Syracuse, N. Y.
Potter & Johnston Co., 1027 Newport Ave., Pawtucket, R. I.
Pratt & Whitney, West Hartford 1, Conn.
Russell, Holbrook & Henderson, Inc., 292 Madison Ave., New York 17, N. Y.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Axle

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Seneca Falls, Mch. Co., Seneca Falls, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Bench

Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Hardinge Bros., Inc., 1418 College Ave., Elmira, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

LATHES, Boring

Bullard Co., Brewster St., Bridgeport 2, Conn.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Crankshaft

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

LATHES, Double-End

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford Ill.

LATHES, Duplicating

H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Sidney Machine Tool Co., Sidney, Ohio.

LATHES, Engine and Toolroom

American Tool Works Co., Pearl and Eggleston Aves., Cincinnati, Ohio.
Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
Hendey Machine Co., Inc., Torrington, Conn.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Logan Engrg. Co., 4901 W. Lawrence Ave., Chicago 30, Ill.
Monarch Machine Tool Co., 27 Oak St., Sidney, Ohio.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pan-American Export Corp., 140-53rd St., Brooklyn 32, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sheldon Mch. Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Sidney Machine Tool Corp., Sidney, Ohio.
Simmons Machine Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.

LATHES, Gap

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
Cincinnati Lathe & Tool Co., 3207-3211 Disney St., Oakley, Cincinnati 9, Ohio.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
H.E.B. Machine Tools, Inc., 475 Fifth Ave., New York 17, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
Nebel Machine Tool Co., 3401 Central Parkway, Cincinnati 25, Ohio.
Seneca Falls Mch. Co., Seneca Falls, N. Y.
Sidney Machine Tool Co., Sidney, Ohio.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Gun

Consolidated Mch. Tool Corp., Rochester, N. Y.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Seneca Falls Mch. Co., Seneca Falls, N. Y.

LATHES, Hollow Spindle

Axelson Mfg. Co., P. O. Box 15335, Vernon Sta., Los Angeles 58, Calif.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Lehmann Machine Co., 3560 Chouteau Ave., St. Louis, Mo.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

(*Continued on page 392*)

For more information on products advertised, use Inquiry Card, page 247

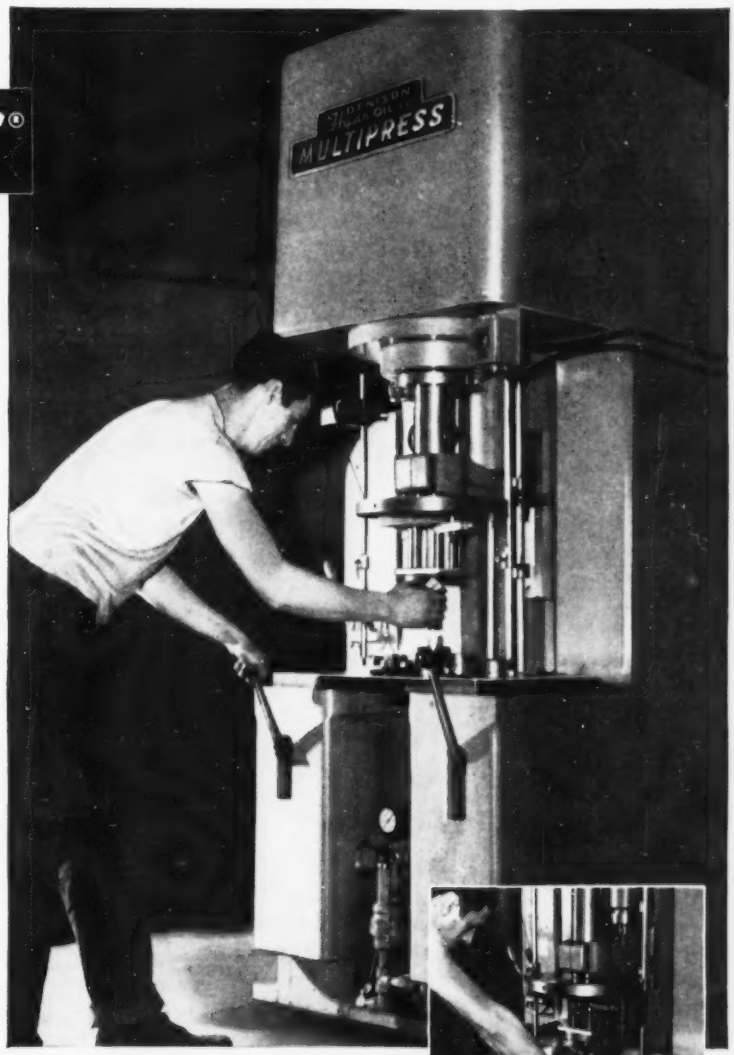
MULTIPRESS . . . smooth oil-hydraulic power, designed for cost-cutting production

MULTIPRESS®

Improves

DEEP DRAWING

Production for Radiad*



"We find that the smooth, evenly controlled speed of the Multipress ram does a better job on a wide range of deep drawing operations," says Mr. Ed Foertsch, President of *Radiad Service, Inc., Chicago.

For most deep drawing operations, Radiad, a widely experienced contract manufacturer uses the 50-ton Denison Multipress. A second hydraulic ram mounted in the U-slot base of the press permits up to 8 tons of upward pressure . . . for added cushioning effect on some operations.

"We also gain by pinch-trimming many flared-lip shapes as part of the final draw," Mr. Foertsch added.

Like many other users, Radiad has proved to themselves that Multipress, with its versatility and speed, is the low-cost answer to drawing needs.

There's no hammer-blow impact as Multipress tooling contacts the work. A steady, positive stream of power draws the metal SMOOTHLY into shape. Stroke length, ram speed, and pressure limits are easily pre-set to suit each job, or to the flow characteristics of any metal. And the Multipress ram can be set to reverse the instant a pre-set pressure is attained.

Dual Multipress controls increase safety on drawing jobs at Radiad.

As a result, deeper draws can be made. Multiple-stage jobs can often be handled in *half the draws required by other equipment*. There's less wear and tear on tooling. Costly dies last longer, are less subject to damage. And the need for pre-draw annealing is often eliminated.



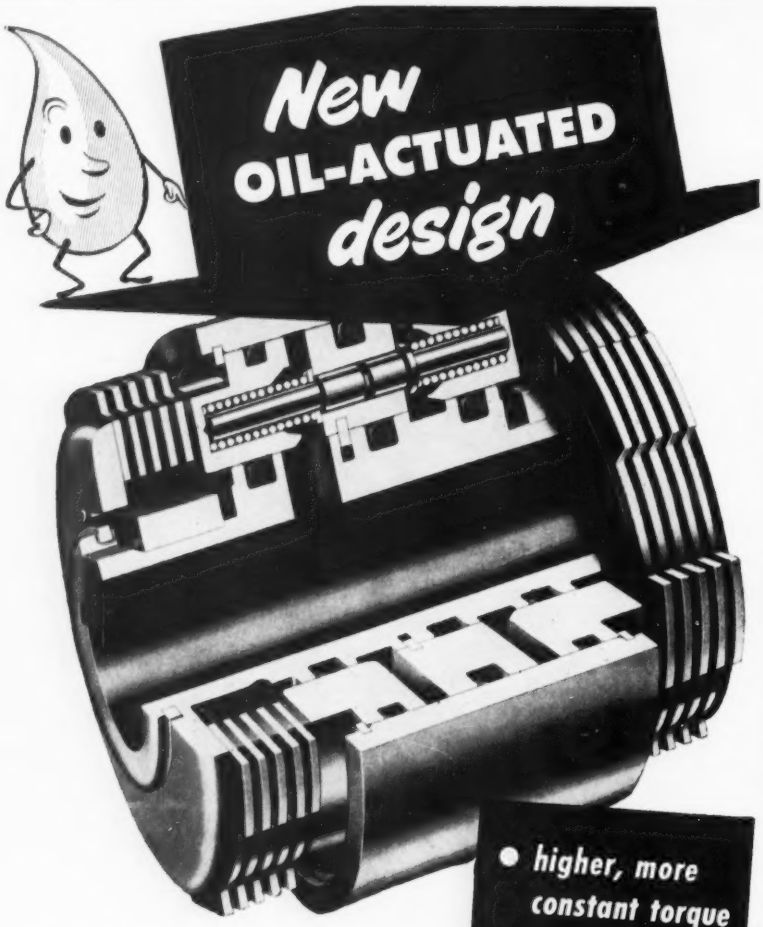
INDUSTRY'S RIGHT HAND

DENISON HydrOILics

Many additional features make Multipress a profitable investment; not only for drawing, but for broaching, bending, forming, stamping, staking, crimping, flaring, riveting, and many other operations. Multipress is built in both bench and floor models; one-ton to 75-ton capacities. Manual or automatic controls for any requirement. Standard Multipress accessories available for many specialized operations. Send for a copy of "MULTIPRESS, and how YOU can use it" or write for information covering your specific needs. There's no obligation.

The DENISON Engineering Company, 1152 Dublin Road, Columbus 16, Ohio

For more information on products advertised, use Inquiry Card page 247



Check the features of this new line of multiple plate clutches: Integral oil cylinder clamps plate stack, automatically maintaining constant torque . . . *eliminating* all need for adjustment. *High torque capacity*—directly proportionate to oil pressure—permits use of smaller, more compact clutch. *Readily adaptable to remote control,* thus eliminating complicated actuating linkage.

That's the performance you'll get from the new Twin Disc Model MOS (single) or MOD (duplex) Oil-Actuated Multiple Plate Clutch.

Write for complete information.

- *higher, more constant torque*
- *no adjustments*
- *more compactness*
- *push-button control at less cost*

Model MOD (duplex) Oil-Actuated Multiple Plate Clutch—cutaway view shows integral oil-cylinder. Also available in Model MOS (single).

TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES

TWIN DISC

TWIN DISC CLUTCH COMPANY, Racine, Wisconsin • HYDRAULIC DIVISION, Rockford, Illinois

BRANCHES: CLEVELAND • DALLAS • DETROIT • LOS ANGELES • NEWARK • NEW ORLEANS • SEATTLE • TULSA

LATHES, Manufacturing Type
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.

LATHES, Spinning
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
Ferracute Machine Co., Bridgeton, N. J.

LATHES, Toolroom
See Lathes, Engine and Toolroom.

LATHES, Turret
Bardons & Oliver, Inc., Ft. W. 9th St., Cleveland 13, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.
Hardinge Brothers, Inc., (Bench or Cabinet Mounting), 1418 College Ave., Elmira, N. Y.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
LeBlond, R. K., Mch. Tool Co., Madison and Edwards Rds., Cincinnati 18, Ohio.
Millholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
Morey Mchry. Co., Inc., 410 Broome St., New York, N. Y.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Potter & Johnston Co. (Automatic), 1027 Newport Ave., Pawtucket, R. I.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Springfield Mch. Tool Co., Springfield, Ohio.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

LATHES, Vertical Turret
American Steel Foundries, King Mch. Tool Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

LAYOUT FLUID
Dykem Co., 2303 P. North 11th St., St. Louis 6, Mo.

LEVELS
Bullard Co., Brewster St., Bridgeport 2, Conn.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

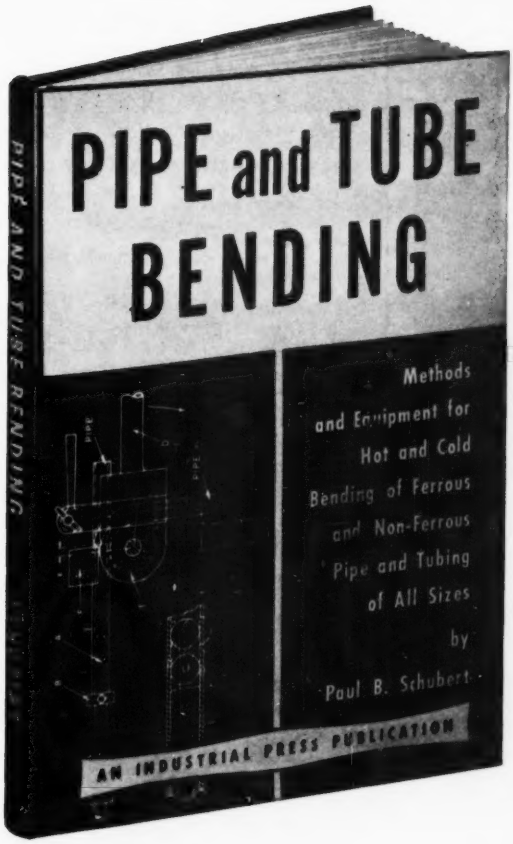
LOCKNUTS
Link-Belt Co. (For Positioning Bearings), 519 N. Holmes Ave., Indianapolis 6, Ind.

LUBRICANTS, Including Extreme Pressure (EP) Machinery Lubricants
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton, E. F., & Co., 303 W. Lehigh Ave., Philadelphia, Pa.
Lubriplate Div., Fiske Bros. Refining Co., 120 Lockwood St., Newark 5, N. J.
Shear-Speed Chem. Prod. Div., Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.
Sinclair Refining Co., 600 5th Ave., New York, N. Y.
Standard Oil Co. (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart, D. A., Oil Co., Ltd., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

LUBRICATING SYSTEMS
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Farvel Corp., 3249 E. 80th St., Cleveland, Ohio.
Madison-Kipp Corp., Madison, Wis.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.

(Continued on page 394)

For more information on products advertised, use Inquiry Card, page 247



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- Wrinkle Bending
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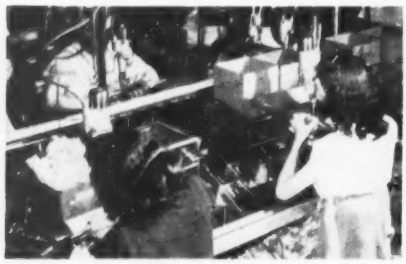
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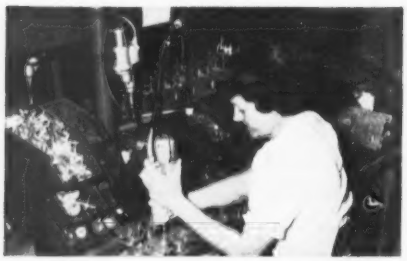


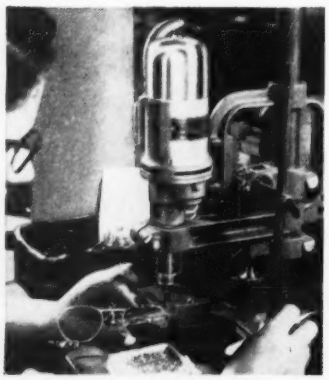
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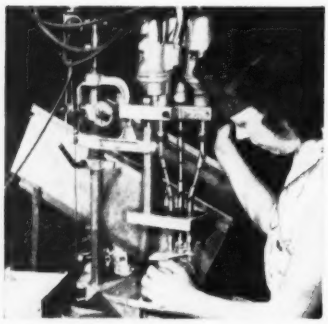
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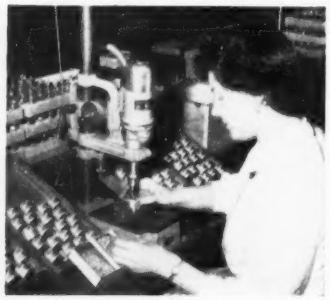




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Conforming Matrix Corp., 342 Toledo Factories Bldg., Toledo 2, Ohio.

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Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Federal Products Corp., P. O. Box 1027, Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MEASURING WIRES, THREAD, SPLINE AND GEAR

Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

METAL, Bearings

See Bearings, Bronze, Babbitt, Etc., and Bushings, Brass, Bronze, Etc.

METERS

See Recording Instruments.

MICROMETERS

Ames, B. C., Co. (Dial), Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Millers Falls Co., Greenfield, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.

MICROSCOPES, Toolmakers

Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Groton, George, Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st St., Milwaukee 14, Wis.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sunstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Van Keuren Co., 176 Waltham St., Watertown, Boston, Mass.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING AND CENTERING MACHINES

Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Jones & Lamson Mch. Co. (Automatic), 160 Clinton St., Springfield, Vt.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

(Continued on page 396)

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DUST COLLECTING UNITS

They are used on surface and other grinders where grinding dust must be removed.

Inexpensive, compact units, with no moving parts. Operated from your present air supply.

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Available in 700 series for grinding wheels 7" dia. or less.

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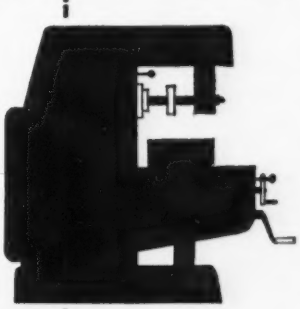


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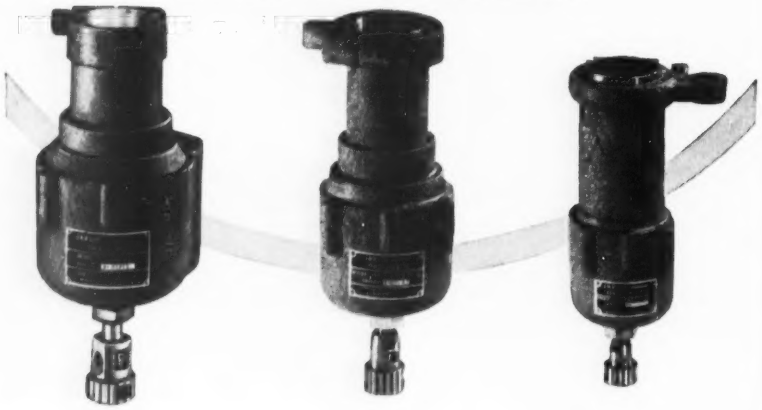
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Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Jones & Lamson Mch. Co., 160 Clinton St., Springfield, Vt.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Bench

Hardinge Bros., Inc. (Bench or Pedestal Type), 1418 College Ave., Elmira, N. Y.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Circular Continuous

Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Duplex

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Machine Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

MILLING MACHINES, Hand

Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Nichols-Morris Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Horizontal, Plain and Universal

Austin Industrial Corp., 76 Mamaroneck Ave., White Plains, N. Y.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Columbia Export Co., Inc., 10-35 44th Dr., Long Island City, N. Y.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cosa Corp., 405 Lexington Ave., New York 17.
Fray Machine Tool Co., 151 W. Windsor Rd., Glendale 4, Calif.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Greaves Mch. Tool Co., 2009 Eastern Ave., Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Kempsmith Machine Co., 1819 S. 71st. St., Milwaukee 14, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.

For more information on products advertised, use Inquiry Card, page 247

Pratt & Whitney, West Hartford 1, Conn.
Sheldon Machine Co., Inc., 4240-4258 N. Knox Ave., Chicago 41, Ill.
Simmons Mch. Tool Corp., 1600 N. Broadway, Albany, N. Y.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Lincoln Type

Brown & Sharpe Mfg. Co., Providence, R. I.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Planer Type

Consolidated Mch. Tool Corp., Rochester, N. Y.
Espen-Lucas Mch. Works, Front St. and Girard Ave., Philadelphia, Pa.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn. R. R. Evanston, Cincinnati, Ohio.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Pratt & Whitney, West Hartford 1, Conn.

MILLING MACHINES, Planetary Type

Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.

MILLING MACHINES, Profile

Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Groton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

MILLING MACHINES, Ram Type Universal

Fray Machine Tool Co., 515 W. Windsor Rd., Glendale 4, Calif.
Van Norman Co., 3640 Main St., Springfield 7, Mass.

MILLING MACHINES, Turret Type

Bridgeport Machines, Inc., Linley Ave., Bridgeport, Conn.

MILLING MACHINES, Vertical

Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ekstrom, Carlson & Co., 1437 Railroad Ave., Rockford, Ill.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Ingersoll Milling Mch. Co., 2442 Douglas St., Rockford, Ill.
Kearney & Trecker Corp., Milwaukee, Wis.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Pratt & Whitney, West Hartford 1, Conn.
Reed-Prentice Corp., 677 Cambridge St., Worcester, Mass.
Snyder Tool & Engrg. Co., 3400 E. Lafayette, Detroit 7, Mich.
Sunstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MODEL AND EXPERIMENTAL WORK

See Special Machinery and Tools.

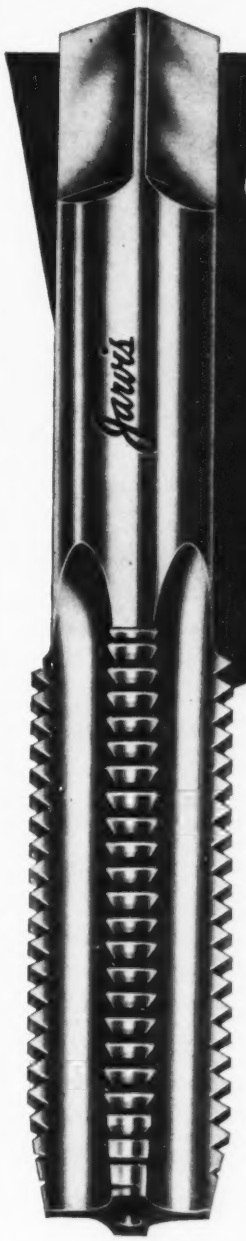
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Cosa Corp., 405 Lexington Ave., New York 17.
Gorton, Geo., Mch. Co., 1110 W. 13th St., Racine, Wis.
Pratt & Whitney, West Hartford 1, Conn.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.

MOLDING MACHINES, Plastic

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.

(Continued on page 398)



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Rockford Machine Tool Co., 2500 Kiswaukee St., Rockford, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

MOTORS, Electric

Delco Products Div., General Motors Corp., 321 E. First St., Dayton, Ohio.
General Electric Co., Schenectady, N. Y.
Reliance Electric & Engrg. Co., 1074 Ivanhoe Rd., Cleveland 10, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

MOTORS, Hydraulic

Gerotor May Corp., Oliver St. and Maryland Ave., Baltimore, Md.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

MULTIPLE-SLIDE FORMING MACHINES

Nilson Machine Co., A. H., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

NIBBLING MACHINES

Campbell Machine Div., American Chain & Cable Co., Inc., 929 Connecticut Ave., Bridgeport, Conn.

NIBBLING MACHINES, Nickel

International Nickel Co., Inc., 67 Wall St., New York, N. Y.

NIPPLE THREADING MACHINERY

Landis Machine Co., Inc., Waynesboro, Pa.

NUT MAKING MACHINERY

National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.

NUT SETTING EQUIPMENT

See Screw Driving and Nut Setting Equipment.

NUT TAPPERS

See Bolt and Nut Machinery.

NUTS, Cold Forged, Wing and Cap

Chicago Screw Co., Bellwood, Ill.
Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.
Republic Steel Corp., (Union Drawn Steel Div.), Republic Bldg., Cleveland 1, Ohio.
Union Drawn Steel Co., Div., Republic Steel Corp., Massillon, Ohio.

NUTS, Self-locking

Grip Nut Co., 310 S. Michigan Ave., Chicago 4, Ill.

NUTS, Thumb or Wing and Cap

Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Republic Steel Corp., Bolt and Nut Div., Republic Bldg., Cleveland 1, Ohio.

OIL CUPS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL EXTRACTORS AND CLEANERS

De Laval Separator Co., Poughkeepsie, N. Y.

OIL GROOVERS

Wicaco Machine Co., Stenton Ave. and Louden St., Philadelphia, Pa.

OIL-HOLE COVERS

Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.

OIL SEALS

Crane Packing Co., 1800 Cuyler Ave., Chicago, Ill.
Garlock Packing Co., Palmyra, N. Y.

OILERS AND LUBRICATORS

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Gits Bros. Mfg. Co., 1846-62 Kilbourn Ave., Chicago, Ill.
Madison-Kipp Corp., Madison, Wis.

OILS, Cutting

See Cutting and Grinding Fluids.

OILS, Lubricating

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.
Sun Oil Co., 1608 Walnut St., Philadelphia, Pa.
Texas Co., 135 E. 42nd St., New York, N. Y.
Tide Water Associated Oil Co., 17 Battery Place, New York, N. Y.

OILS, Quenching and Tempering

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Cities Service Oil Co., 70 Pine St., New York, N. Y.
Gulf Oil Corp., Gulf Bldg., Pittsburgh 30, Pa.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Sinclair Refining Co., 600 5th Ave., New York.
Standard Oil Co., (Indiana), 910 S. Michigan, Chicago, Ill.
Stuart Oil Co., Ltd., D. A., 2739 S. Troy St., Chicago 23, Ill.

OILS, Soluble

See Compounds, Cutting, Grinding, Metal Drawing, Etc.

OPTICAL FLATS

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.

ORDNANCE MACHINES, Spelial

Rehnberg-Jacobson Mfg. Co., 2135 Kiswaukee St., Rockford, Ill.

PACKING, Leather, Metal, Rubber, Asbestos, Etc.

Crane Packing Co., 1800 Cuyler Ave., Chicago.
Garlock Packing Co., Palmyra, N. Y.
Houghton & Co., E. F., 303 W. Lehigh Ave., Philadelphia, Pa.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PAINTING EQUIPMENT, Spray

Lowe Bros. Co., Dayton, Ohio.
Ransburg Electro-Coating Corp., 1234 Barth, Indianapolis 7, Ind.

PARALLELS

Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Hess Ave., Saginaw, Mich.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker, O. S., Co., Inc., Worcester, Mass.

PATTERNS, Wood and Metal

Mummert-Dixon Co., Hanover, Pa.

PILLOW BLOCKS

Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
C & C Sales Corp., 1771 Broadway, New York 19, N. Y.
Link-Belt Co., 519 N. Holmes Ave., Indianapolis 6, Ind.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

PIPE, BRASS AND COPPER

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

PIPE STEEL

Alleghany Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Orban, Kurt, Co., Inc., 205 East 42nd St., New York 17, N. Y.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
United States Steel Corp., National Tube Co., Div., 436 7th Ave., Pittsburgh, Pa.

PIPE THREADING AND CUTTING MACHINES

Landis Machine Co., Inc., Waynesboro, Pa.

PIPE TONGS

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

PLANER ATTACHMENTS

Consolidated Mch. Tool Corp., Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves, Detroit, Mich.

PLANERS, Double Housing and Openside

Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio (Plate).
Consolidated Mch. Tool Corp. (Incl. Plate, Rotary and Crank Types), Rochester, N. Y.
Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Gray, G. A., Co., Woodburn Ave. and Penn R. R., Evanston, Cincinnati, Ohio.
Morton Mfg. Co., Muskegon Heights, Mich.
Pan-American Export Corp., 140-53rd St., Brooklyn 32, N. Y.
Rockford Machine Tool Co., 2500 Kishwaukee St., Rockford, Ill.

PLASTIC AND PLASTIC PRODUCTS

Bakelite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York 17, N. Y.

PLATE ROLLS

Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Ryerson, Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

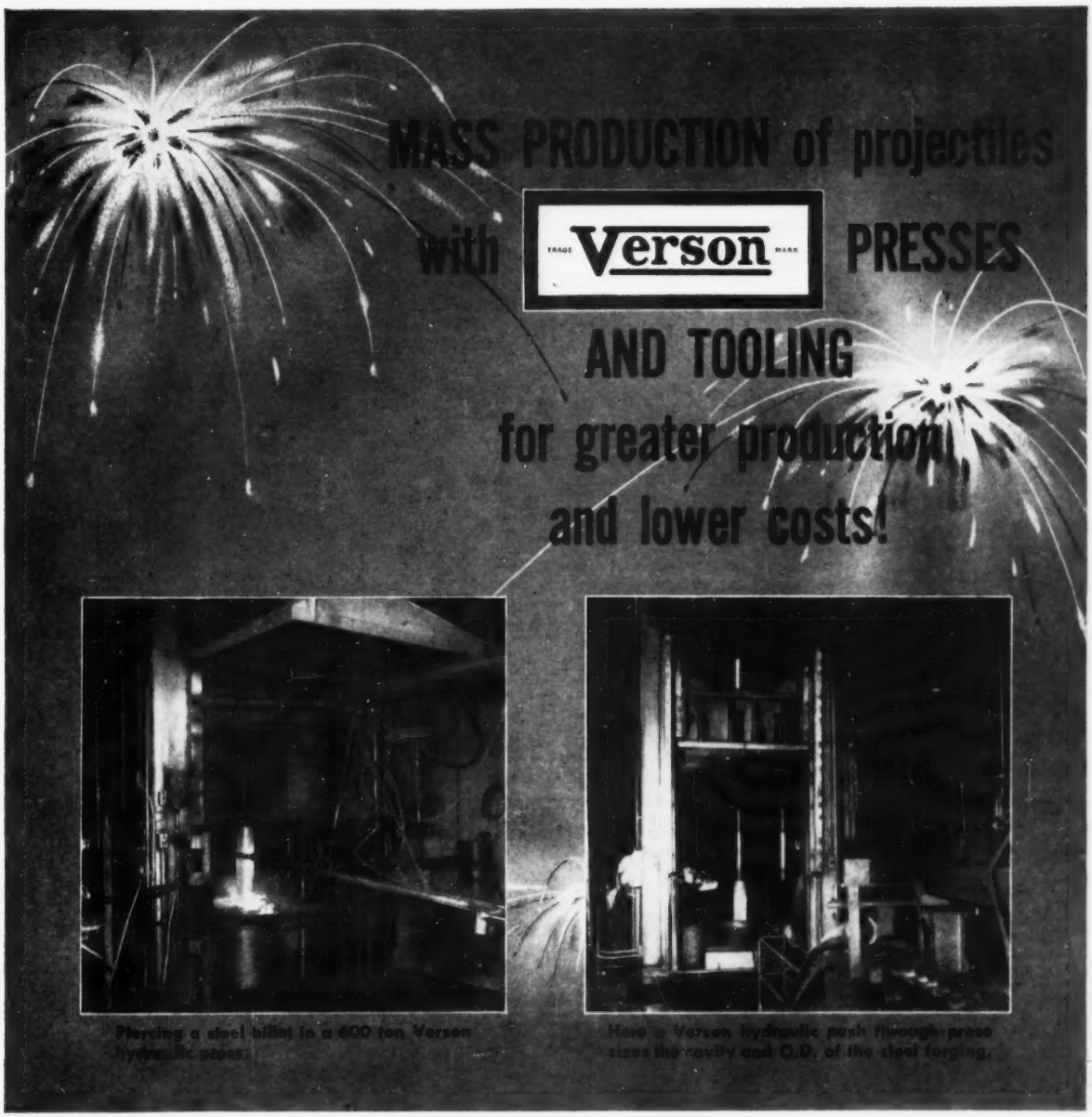
PLATES, Surface

Brown & Sharpe Mfg. Co., Providence, R. I.
Brush Electronics Co., 3405 Perkins Ave., Cleveland 14, Ohio.
Challenge Machinery Co., Grand Haven, Mich.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Pratt & Whitney Div., West Hartford 1, Conn.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.

PNEUMATIC EQUIPMENT

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
Bellows Co., 230 W. Market St., Akron, Ohio.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago.
Ingersoll-Rand Co., Phillipsburg, N. J.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.

(*Continued on page* 400)



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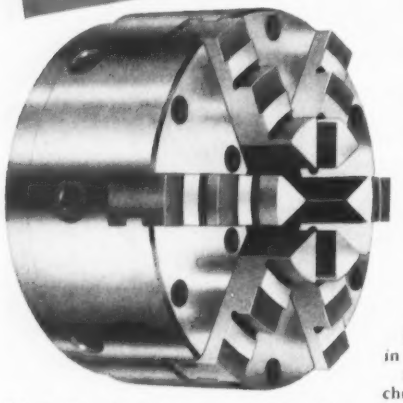
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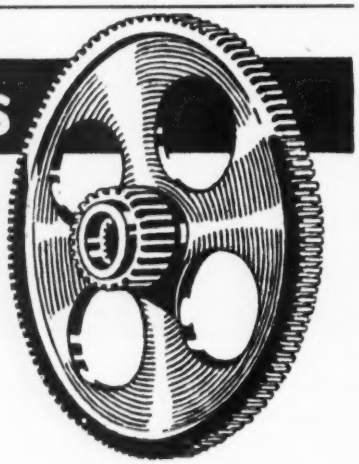
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Hammond Machinery Builders, Inc., 1600 Douglas Ave., Kalamazoo 54, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Millers Falls Co., Greenfield, Mass.
Standard Electrical Tool Co., 2488-90 River Rd., Cincinnati 4, Ohio.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

POLISHING TOOLS, Portable

Cleco Div., Reed Roller Bit Co., 5125 Clinton Ave., Houston 20, Texas.
Jarvis, Charles L., Co., Middletown, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sundstrand Machine Tool Co., 2531 11th St., Rockford, Ill.

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PRESSES, Arbor

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Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilburn Ave., Chicago.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Tomkins-Johnson Co., 614 No. Mechanic St., Jackson, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PRESSES, Broaching

American Broach & Mch. Co., Ann Arbor, Mich.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Colonial Broach Co., P.O. Box 37, Harper Sta., Detroit 13, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Die Tryout

Alpha Tool Works, 9281 Freeland Ave., Detroit 28, Mich.

PRESSES, Extrusion

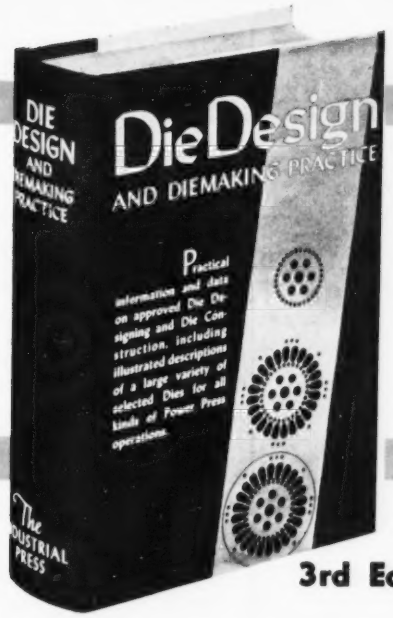
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Co., Kenmore Station, Buffalo, N. Y.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

PRESSES, Foot

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
B & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.

(*Continued on page* 402)

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Bethlehem Steel Co., Bethlehem, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morgan Engrg. Co., Alliance, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Verson Allsteel Press Co., 93rd St. and S. Kenwood Ave., Chicago, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

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American Broach & Mch. Co., Ann Arbor, Mich.
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Birdsboro Steel Fdry. & Mch. Co., Birdsboro, Pa.
Bliss Co., E. W., 1375 Raff Rd., S. W., Canton Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Clearing Machine Corp., 6499 W. 65th St. Chicago 38, Ill.
Clifton Hydraulic Press Co., Clifton, N. J.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Erie Foundry Co., Erie, Pa.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Farrel-Birmingham Co., Inc., 25 Main St., Ansonia, Conn.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Lapointe Machine Tool Co., 34 Tower St., Hudson, Mass.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Turner Bros., Inc., 2625 Hilton Rd., Ferndale 20, Mich.
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Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

PRESSES, Pneumatic

Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

PRESSES, Screw

Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St. Chicago 44, Ill.
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(*Continued on page* 404)

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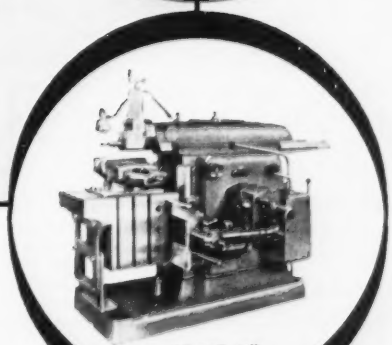


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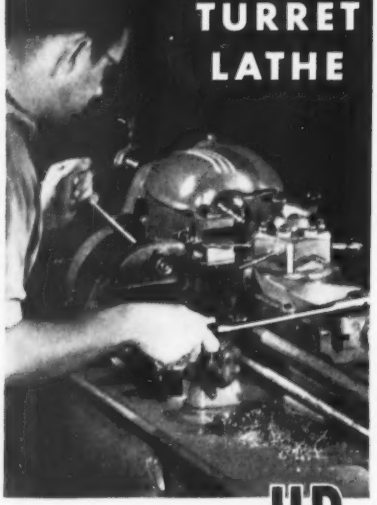
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Bliss Co., E. W., 1375 Raff Rd., S. W., Canton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Clearing Machine Corp., 6499 W. 65th St., Chicago 38, Ill.
Cleveland Crane & Engrg. Co., Wickliffe, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Danly Machine Specialties, Inc., 2107 S. 52nd Ave., Chicago 50, Ill.
Dreis & Krump Mfg. Co., 7416 Loomis Blvd., Chicago 36, Ill.
Espen-Lucas Machine Works, Front St., and Girard Ave., Philadelphia, Pa.
Famco Machine Co., 3134 Sheridan Rd., Kenosha, Wis.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Ferracute Machine Co., Bridgeton, N. J.
Henry & Wright Div., Emhart Mfg. Co., 760 Windsor St., Hartford 1, Conn.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Johnson Mch. & Press Corp., 620 W. Indiana Ave., Elkhart, Ind.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
L & J Press Corp., Elkhart, Ind.
Minster Machine Co., Minster, Ohio.
Niagara Machine & Tool Works, 683 Northland Ave., Buffalo, N. Y.
Peck, Stow & Wilcox Co., Southington, Conn.
Sales Service Mch. Tool Co., 2363 University Ave., St Paul, Minn.
Verson Allsteel Press Co. 93rd St. and S. Kenwood Ave., Chicago, Ill.
V & O Press Co., Div. Emhart Mfg. Co., Hudson, N. Y.
Walsh Press & Die Co., 4727 W. Kinzie St., Chicago 44, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.
Zeh & Hahnemann Co., 182 Vanderpool St., Newark, N. J.

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American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.
Baldwin-Lima-Hamilton Corp., Lima-Hamilton Div., Hamilton, Ohio.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Dake Engine Co., 604 Seventh St., Grand Haven, Mich.
Farquhar, A. B., Div., Oliver Corp., 21 Duke St., York, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hufford Machine Works, Inc., 1700 E. Grand Ave., El Segundo, Calif.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Morgan Engrg. Co., Alliance, Ohio.
Niagara Machine & Tool Works, (Hydraulic) 683 Northland Ave., Buffalo, N. Y.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wilson, K. R., 215 Main St., Buffalo, N. Y.

PROFILE—TRACING ATTACHMENTS

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Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Gorton, George, Machine Co., 1110 W. 13th St., Racine, Wis.
Morey Mchry. Co., Inc. (and affiliated companies), 410 Broome St., New York, N. Y.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Pines Engineering Co., Inc., Aurora, Ill.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

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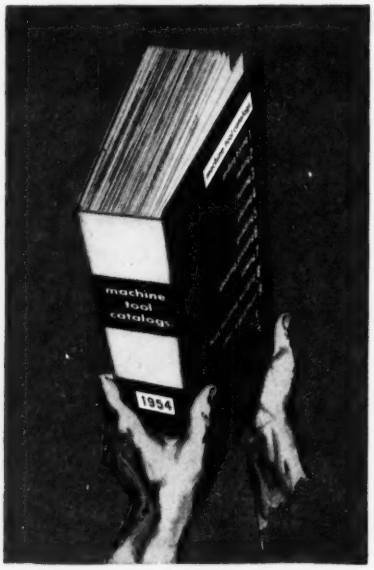
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

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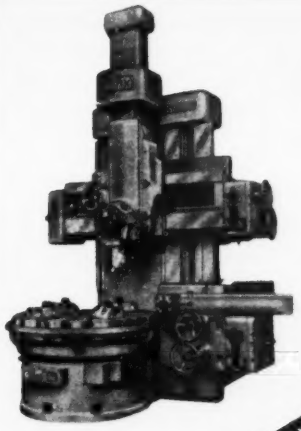
Armstrong Bros. Tool Co.	Motch & Merryweather Machinery Co
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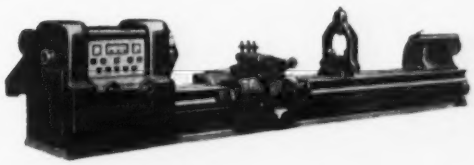
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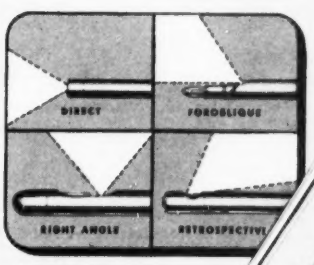
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Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 12, Ohio.
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South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Tompkins-Johnson Co., Jackson, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
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Barnes, John S., Corp., Rockford, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
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Chambersburg Engrg. Co., Chambersburg, Pa.
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Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
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Viking Pump Co., Cedar Falls, Iowa.
Vinco Corp., 9113 Schaefer Highway, Detroit 28, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

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Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Cleveland Punch & Shear Works Co., 3917 St. Clair Ave., N. E., Cleveland, Ohio.
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Famco Machine Tool Co., 3134 Sheridan Rd., Kenosha, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Niagara Mch. & Tool Works, 683 Northland Ave., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Lake City, Minn.
Ryerson Joseph T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wiedemann Machine Co., 4272 Wissahickon Ave., Philadelphia, Pa.

RACKS, Gear Cut

Amgears, Inc., 6633 W. 65th St., Chicago 38, Ill.
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Boston Gear Works, 3200 Main St., North Quincy 71, Mass.
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Gear Specialties, Inc., 2635 W. Medill Ave., Chicago 47, Ill.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Massachusetts Gear & Tool Co., 36 Nassau St., Woburn, Mass.
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Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia, Pa.
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Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
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Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
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Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Keo Cutters, 19326 Woodward, Detroit, Mich.
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McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
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Pratt & Whitney, West Hartford 1, Conn.
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Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
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Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

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McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
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Taft-Peirce Mfg. Co., Woonsocket, R. I.
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Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
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Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
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Greenfield Tap & Die Corp., Greenfield, Mass.
Kaufman Manufacturing Co., Manitowoc, Wis.
Lipe-Rollway Corp., 806 Emerson Ave., Syracuse, N. Y.
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Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Union Twist Drill Co., Athol, Mass.
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(Continued on page 408)

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National Acme Co., 170 E. 131st St., Cleveland, Ohio.

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Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
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Morgan Engrg. Co., Alliance, Ohio.
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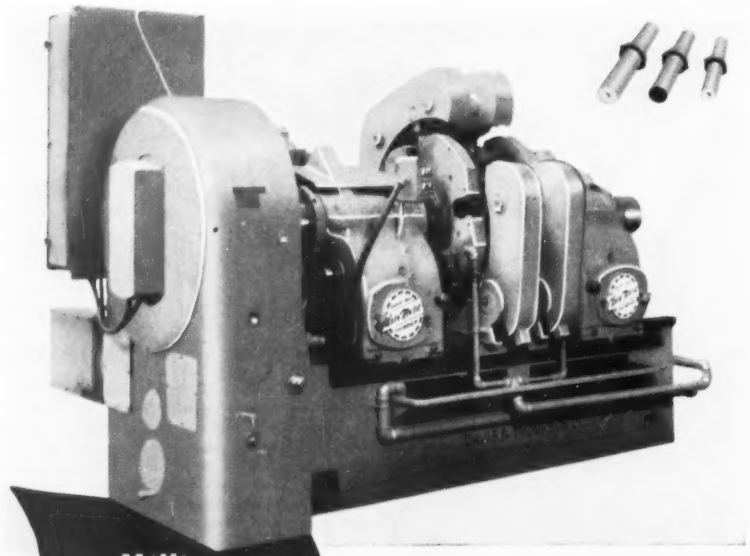
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Tannewitz Works, 315 Front St., N. W., Grand Rapids 2, Mich.
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Anderson Bros. Mfg. Co., 1910 Kishwaukee St., Rockford, Ill.

(*Continued no page* 410)

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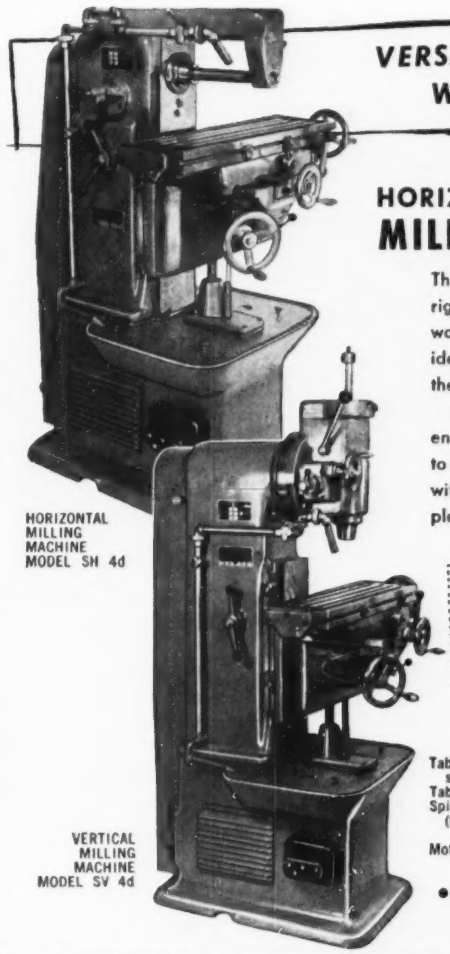
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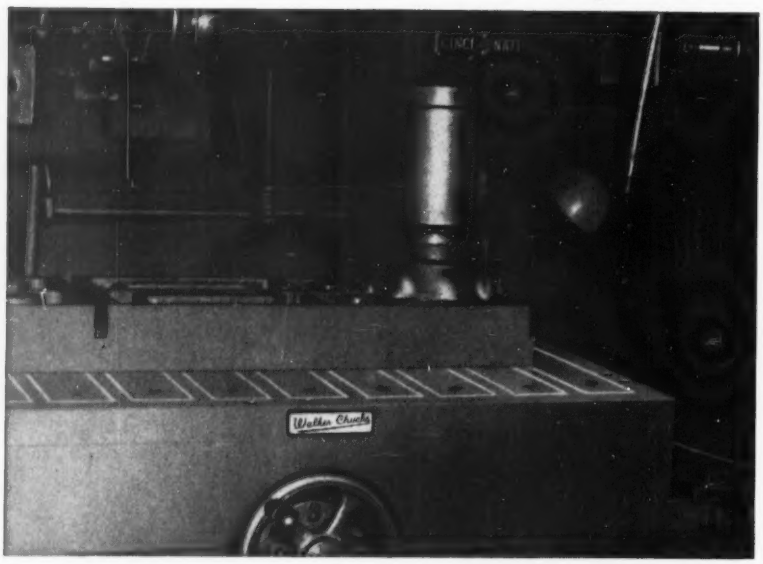
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(*Continued on page* 412)

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Bethlehem Steel Co., Bethlehem, Pa.
Crucible Stele Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Jones & Laughlin Steel Corp., Gateway Scenter No. 3 Bldg., Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Union Drawn Steel Div., Massillon, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Summerill Tubing Co. Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp., (American Steel & Wire Co. Div.) 436 7th Ave., Pittsburgh, Pa.,
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, High Speed Tool

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 Armstrong Ave., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Machine

Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg, Pittsburgh, Pa.
LaSalle Steel Co., Hammond, Ind.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T. & Son, Inc., 2558 W. 16th St. Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Stainless

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Redeemer, Pa.
Carpenter Steel Co., Reading, Pa.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Timken Roller Bearing Co., Canton, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div. Carnegie-Illinois Steel Corp. Div.), 436 7th Ave., Pittsburgh, Pa.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

STEEL, Strip and Sheet

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
U. S. Steel Corp. (American Steel & Wire Co. Div., Carnegie-Illinois Steel Corp. Div., Columbia Steel Co. Div., Tennessee Coal, Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

STEEL, Tool and Die

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Carpenters Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.

STEEL, Zinc, Tin and Copper Coated Strip

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.

STEEL ALLOYS

See Alloys, Steel

STEEL BARS

See Bars, Steel

STEEL STOCK GROUND FLAT

Brown & Sharpe Mfg. Co., Providence, R. I.
Starrett, The L. S., Co., Athol, Mass.
Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.

STELLITE

Haynes Stellite Div., Union Carbide & Carbon Corp. (Alloy), 30 E. 42nd St., New York, N. Y.

STOCKS, Die

Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. of Union Twist Drill Co., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

STONES, Oil or Sharpening

Bay State Abrasive Co., Westboro, Mass.
Carborundum Co., Buffalo Ave., Niagara Falls, N. Y.
Norton Co., 1 New Bond St., Worcester 6, Mass.

STOOLS

Standard Pressed Steel Co., Jenkintown, Pa.

STRAIGHTEDGES

Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

STRAIGHTENERS, Flat Stock and Wire

Nilson, A. H., Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

STRAIGHTENING MACHINERY

American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Chambersburg Engrg. Co., Chambersburg, Pa.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Consolidated Mch. Tool Corp., Rochester, N. Y.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lake Erie Engrg. Corp., Kenmore Station, Buffalo, N. Y.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4, Wis.
Springfield Mch. Tool Co., Springfield, Ohio.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.

(Continued on page 414)



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Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.

SUB-PRESSES
Waltham Machine Works, Newton St., Waltham, Mass.

SUPERFINISHING MACHINES
Gisholt Machine Co., 1245 E. Washington Ave., Madison 10, Wis.

SURFACE PLATES
See Plates, Surface

SWAGING MACHINES
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Torrington Co., Torrington, Conn.

SWITCHES
Allen-Bradley Co., 1326 S. 2nd St., Milwaukee, Wis.
Centrol Products, Inc., (Waterproof and Thermal), 306 Sussex St., Harrison, N. J.
General Electric Co., Schenectady, N. Y.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

TACHOMETERS
Scherr, George Co., Inc., 200 Lafayette St., New York 12, N. Y.
Veeder-Root, Inc., 20 Sargent St., Hartford, Conn.

TAPER PINS, Standard
Alimetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only).
Chicago Screw Co., Bellwood, Ill.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.

TAP HOLDERS
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
McCrosky Tool Co., 1938 Thomas St., Meadville, Pa.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill.

TAPPING ATTACHMENTS AND DEVICES
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
Errington Mechanical Laboratory, Inc., 24 Norwood Ave., Stapleton, S. I., N. Y.
Ettco Tool Co., Inc., 592 Johnson Ave., Brooklyn, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Thriftmaster Products Corp., 1076 N. Plum St., Lancaster, Pa.

TAPPING MACHINES
Associated Mch. Tool Corp., P. O. Box 9666, 535 McNeilly Rd., Pittsburgh 26, Pa.
Avey Drilling Mach. Co., 26 E. Third St., Covington, Ky.
Baker Bros., Inc., Station F, P. O. Box 101, Toledo 10, Ohio.
Barnes Drill Co., 814 Chestnut, Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Baush Machine Tool Co., 156 Wason Ave., Springfield 7, Mass.
Bodine Corp., 317 Mt. Grove St., Bridgeport, Conn.
Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Buhr Mch. Tool Co., 835 Green St., Ann Arbor, Mich.
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Cleveland Tapping Machine Co., Canton 6, Ohio.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Hamilton Tool Co., 834 South 9th St., Hamilton, Ohio.
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Jarvis, Chas. L., Co., Middletown, Conn.
Kaufman Manufacturing Co., Manitowoc, Wis.
Kingsbury Mch. Tool Corp., Keene, N. H.
Leland-Gifford Co., 1025 Southbridge St., Worcester, Mass.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Moline Tool Co., 102 20th St., Moline, Ill.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
National Automatic Tool Co., Inc., S. 7th and N Sts., Richmond, Ind.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.

TAPPING MACHINES, Nut
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
National Machinery Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.

TAPS
Besly-Welles Corp., Beloit, Wis.
Butterfield Div., Union Twist Drill Co., Derby Line, Vt.
Card, S. W., Mfg. Co., Div. Union Twist Drill Co., Mansfield, Mass.
Continental Tool Works, Div. Ex-Cell-O. Corp., Detroit 32, Mich.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Landis Mch. Co. (Solid Adjustable), Waynesboro, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford 1, Conn.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.
Winter Bros. Co., Rochester, Mich.
Wood & Spencer Co., 1930 E. 61st St., Cleveland, Ohio.

TAPS, Collapsing
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Landis Mch. Co., Waynesboro, Pa.
National Acme Co., 170 E. 131st St., Cleveland, Ohio.
Sheffield Corp., 721 Springfield, Dayton, Ohio.

THREAD CUTTING MACHINERY
Brown & Sharpe Mfg. Co., Providence, R. I.
Cosa Corp., 405 Lexington Ave., New York 17, N. Y.
Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis.
Eastern Mch. Screw Corp., New Haven, Conn.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Hirschmann, Carl, Co., 30 Park Ave., Manhasset, N. Y.
Kaufman Manufacturing Co., Manitowoc, Wis.
Landis Mch. Co., Waynesboro, Pa.
Magna Engineering Corp., 110 Linfield Drive, Menlo Park, Calif.
Pratt & Whitney, West Hartford 1, Conn.
Procunier Safety Chuck Co., 18 S. Clinton St., Chicago, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Snow Mfg. Co., 435 Eastern Ave., Bellwood, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

THREAD CUTTING TOOLS
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Detroit Tap & Tool Co., 8615 E. 8 Mile Rd., Base Line, Mich.
Eastern Mch. Screw Corp., New Haven, Conn.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Fellows Gear Shaper Co., 78 River St., Springfield, Vt.
Geometric Tool Co., Westville Station, New Haven 15, Conn.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Landis Mch. Co., Waynesboro, Pa.
Pratt & Whitney, West Hartford 1, Conn.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

THREAD GAGES
See Gages, Thread.

THREAD GRINDING MACHINES
See Grinding Machines, Thread.

THREAD MILLING MACHINES
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Hall Planetary Co., Fox St. and Abbotsford Ave., Philadelphia 29, Pa.
Hanson-Whitney Co., Div. Whitney Chain Co., Hartford, Conn.
Pratt & Whitney, West Hartford 1, Conn.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Sheffield Corp., 721 Springfield, Dayton, Ohio.
Waltham Machine Works, Newton St., Waltham, Mass.

THREAD ROLLING MACHINES
Hartford Special Mchry. Co., 287 Homestead St., Hartford, Conn.
Hill Acme Co., 1201 W. 65th St., Cleveland 2, Ohio.
Reed Rolled Thread Die Co., P. O. Box 350, Worcester 1, Mass.
V & O Press Co., Div., Emhart Mfg. Co., Hudson, N. Y.

TIN AND TERNEPLATES
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (Carnegie-Illinois Steel Corp., Div.; Columbia Steel Co. Div. Tennessee Coal, Iron & R. R. Co., Div.), 436 7th Ave., Pittsburgh, Pa.

TOOL BITS, High Speed Steel
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Besley-Welles Corp., Beloit, Wisc.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Simonds Saw & Steel Co., 470 Main St., Fitchburg, Mass.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Wheelock-Lovejoy & Co., Inc., Cambridge, Mass.

TOOL BITS, Special Alloy
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Vanadium Alloys Steel Co., Latrobe, Pa.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

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TOOL GRINDERS

See Grinding Machines for Sharpening, Turning and Planning Tools.

TOOL GRINDING ATTACHMENTS

Detroit Reamer & Tool Co., 2830 E. 7 Mile Rd., Detroit, Mich.

TOOL HOLDERS

Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Burg Tool Mfg. Co., 3743 Durango Ave., Los Angeles 34, Calif.
Davis Boring Tool Div., Giddings & Lewis Machine Tool Co., Fond du Lac, Wis.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Lovejoy Tool Co., Springfield, Vt.
Maxwell Co., 420 Broadway, Bedford, Ohio.
Michigan Tool Co., 7171 E. McNichols Rd., Detroit, Mich.
Milholland, W. K., Mchry. Co., 6402 Westfield Blvd., Indianapolis 5, Ind.
OK Tool Co., Milford, N. H.
Portage Double Quick Tool Co., 1063 Sweitzer Ave., Akron 11, Ohio.
R and L Tools, 1825 Bristol St., Philadelphia 40, Pa.
Scully-Jones & Co., 1903 Rockwell St., Chicago 8, Ill. (Turret)
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland 3, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.
Western Tool & Mfg. Co., 1640 Wheeler St., Springfield, Ohio.

TOOLMAKERS' INSTRUMENTS

Ames, B. C., Co., Waltham 54, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Scherr, George, Co., Inc., 200 Lafayette St., New York 12, N. Y.
Starrett, The L. S., Co., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

TOOL STEEL

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Columbia Tool Steel Co., Lincoln Hwy. & State St., Chicago Heights, Ill.
Crucible Steel Co. of America, Chrysler Bldg., New York, N. Y.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.
Vanadium Alloys Steel Co., Latrobe, Pa.

TOOLS, Carbide-Tipped

Adamas Carbide Corp., 999 South 4th St., Harrison, N. J.
Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Atrax Co., Newington, Conn.
Beaver Tool & Engineering Corp., 2850 Rochester Rd., Box 429, Royal Oak, Mich.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Chicago-Latrobe Twist Drill Works, 411 W. Ontario St., Chicago, Ill.
Cleveland Twist Drill Co., 1242 E. 49th St., Cleveland, Ohio.
Colonial Broach Co., Detroit 13, Mich.
Eclipse Counterbore Co., 1600 Bonner Ave., Ferndale, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gairing Tool Co., 21225 Hoover Rd., Detroit 32, Mich.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Illinois Tool Works, 2501 North Keeler Ave., Chicago, Ill.
Kennametal, Inc., Latrobe, Pa.
Maxwell Co., 420 Broadway, Bedford, Ohio.
McCrosky Tool Corp., 1938 Thomas St., Meadville, Pa.
Metal Carbides Corp., Youngstown, Ohio.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
OK Tool Co., Milford, N. H.
Precise Products Corp., 1328-30 Clark St., Racine, Wis.
Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich.
Union Twist Drill Co., Athol, Mass.
Wesson Metal Corp., Lexington, Ky.
Whitman & Barnes, 40600 Plymouth Rd., Plymouth, Mich.
Willey's Carbide Tool Co., 1340 W. Vernor Hwy., Detroit 1, Mich.

TOOLS, Lathe, Shaper and Planer

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Apex Tool & Cutter Co., Inc., 237 Canal St., Shelton, Conn.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bullard Co., Brewster St., Bridgeport 2, Conn.
Carboloy Dept., General Electric Co., Box 237, Roosevelt Park Annex, Detroit 32, Mich.
Firth Sterling Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Gorham Tool Co., 14400 Woodrow Wilson, Detroit, Mich.
Haynes Stellite Div., Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Kennametal, Inc., Latrobe, Pa.
Lovejoy Tool Co., Springfield, Vt.
Northwestern Tool & Engrg. Co., 117 Hollier, Dayton, Ohio.
OK Tool Co., Milford, N. H.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Super Tool Co., 21650 Hoover Road, Detroit 13, Mich.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Warner & Swasey Co., 5701 Carnegie Ave., Cleveland, Ohio.
Wesson Co., 1220 Woodward Heights Blvd., Ferndale, Mich.

TRANSFER MACHINES, Automatic

Barnes Drill Co., 814 Chestnut St., Rockford, Ill.
Barnes, W. F. & John, Co., 201 S. Water St., Rockford, Ill.
Colonial Broach Co., P. O. Box 37, Harper Sta., Detroit 13, Mich.
Cross Co., 3250 Bellevue Ave., Detroit 7, Mich.
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 32, Mich.
Morris Machine Tool Co., Inc., 946-M Harriet St., Cincinnati 3, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TRANSFORMERS

General Electric Co., Schenectady, N. Y.

TRANSMISSION, Variable Speed

Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Reliance Electric & Engrg. Co., 1047 Ivanhoe Rd., Cleveland 10, Ohio.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.

TUBE FLANGING MACHINES

Grant Mfg. & Mch. Co., 90 Silliman St., Bridgeport 5, Conn.

TUBE FORMING AND WELDING MACHINES

American Elec. Fusion Corp., 2606 Diversey Ave., W., Chicago, Ill.
Yoder Co., 550 Walworth Ave., Cleveland.

TUBE MILLS

Abbey-Etna Co., 2422 Maplewood Ave., Toledo 10, Ohio.

TUBING, Aluminum

Aluminum Co. of America, Oliver Bldg., Pittsburgh, Pa.

TUBING, Brass and Copper

Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Brass Co., 25 Broadway, New York, N. Y.
Chase Brass & Copper Co., Inc., 1949 Rodney St., Waterbury 20, Conn.
Revere Copper & Brass Inc., 230 Park Ave., New York, N. Y.

TUBING, Flexible

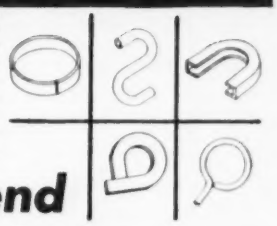
Air Conversion Research Corp., 4107 N. Damen Ave., Chicago 18, Ill.
American Metal Hose Br. American Brass Co., 25 Broadway, New York, N. Y.

TUBING, Steel

Allegheny Ludlum Steel Corp., Pittsburgh, Pa.
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
National Tube Div. U. S. Steel Corp., 525 Wm. Penn Place, Pittsburgh, Pa.
Republic Steel Corp., Steel & Tubes Div., Republic Bldg., Cleveland 1, Ohio.

(Continued on page 416)





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Summerill Tubing Co., Div. Columbia Steel & Shafting Co., P. O. Box 1557, Pittsburgh 30, Pa.
Timken Roller Bearing Co., Canton, Ohio.

TWIST DRILLS
See Drills, Twist

UNIVERSAL JOINTS
Baush Machine Tool Co., 156 Wasson Ave., Springfield 7, Mass.
Boston Gear Works, 3200 Main St., North Quincy 71, Mass.

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Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Philadelphia Gear Works (Motorized), Erie Ave. and G St., Philadelphia, Pa.

VALVES, Air
Bellows Co., 230 W. Market St., Akron, Ohio.
Hannifin Corp., 1101 S. Kilburn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr., Easton, Pa.
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Ross Operating Valve Co., 120 E. Golden Gate, Detroit, Mich.

VALVES, Hydraulic
American Steel Foundries, Elmes Engrg. Div., Paddock Rd. and Tennessee Ave., Cincinnati, Ohio.
Baldwin-Lima-Hamilton Corp., Philadelphia 42, Pa.
Barnes, John S., Corp., Rockford, Ill.
Denison Engrg. Co., 1160 Dublin St., Columbus 16, Ohio.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hunt, C. B., & Son, Inc., 1911 E. Pershing St., Salem, Ohio.
Hydraulic Press Mfg. Co., 300 Lincoln Ave., Mt. Gilead, Ohio.
Lehigh Foundries, Inc., 1500 Lehigh Dr. Easton, Pa.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Oilgear Co., 1560 W. Pierce St., Milwaukee 4.
Rivett Lathe & Grinder, Inc., Brighton, Boston 35, Mass.
Sundstrand Mch. Tool Co., 2531 11th St., Rockford, Ill.
Turchan Follower Mch. Co., 8259 Livernois & Alaska Aves., Detroit, Mich.
Vickers, Inc., 1402 Oakman Blvd., Detroit, Mich.
Watson-Stillman Co., Div. H. K. Porter Co., Inc., Roselle, N. J.
Wood, R. D., Co., Public Ledger Bldg., Philadelphia 5, Pa.

VIBRATION INSULATION
American Felt Co., Glenville, Conn.

VISES, Machine
Armstrong-Blum Mfg. Co., 5700 W. Bloomingdale Ave., Chicago, Ill.
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Bellows Co., 250 W. Market, Akron, Ohio.
Brown & Sharpe Mfg. Co., Providence, R. I.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Hannifin Corp., 1101 S. Kilbourn Ave., Chicago, Ill.
Hendey Machine Co., Inc., Torrington, Conn.
Homestrand Inc., Larchmont, N. Y.
Logansport Machine Co., Inc., 810 Center Ave., Logansport, Ind.
Producto Mch. Co., 990 Housatonic Ave., Bridgeport, Conn.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.
Universal Engineering Co., Frankenmuth 2, Mich.

VISES, Pipe
Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.

VISES, Planer and Shaper
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Shaper Co., Elam and Garrard Aves., Cincinnati, Ohio.
Rockford Mch. Tool Co., 2500 Kishwaukee St., Rockford, Ill.
Skinner Chuck Co., 344 Church St., New Britain, Conn.
South Bend Lathe Works, Inc., 425 E. Madison St., South Bend, Ind.

VISES, Pneumatic
Mead Specialties Co., 4114 North Knox Ave., Chicago 41, Ill.

VOLTMETERS
General Electric Co., Schenectady, N. Y.

WASHERS, Lock
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N. Y. (Stainless Steel only)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WASHERS, Spring
Allmetal Screw Products Co., Inc., 821 Stewart Ave., Garden City, N.Y. (Stainless Steel only)
Eaton Mfg. Co., Reliance Div., 25 Charles Ave., S. E., Massillon, Ohio.

WELDING AND CUTTING EQUIPMENT Oxyacetylene
Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

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Linde Air Products Co., Div. Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.

WELDING EQUIPMENT, Electric Arc
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.
General Electric Co., Schenectady, N. Y., 22801 St. Clair Ave., Cleveland, Ohio.
Westinghouse Electric Corp., Pittsburgh 30, Pa.

WELDING EQUIPMENT, Electric, Spot, Butt, Seam, Etc.
American Electric Fusion Corp., 2606 Diversey Ave., W. Chicago, Ill.
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
DoAll Co., 254 Laurel Ave., Des Plaines, Ill.
Expert Welding Machine Co., 17144 Mt. Elliott Ave., Detroit 12, Mich.

WELDMENTS
Mahon, R. C., Co., Detroit 34, Mich.
Woods, A. C., & Co., Div. Kropp Forge Co., 1129 Harrison Ave., Rockford, Ill.

WIRE
American Steel & Wire Co., Div. U. S. Steel Corp., Rockefeller Bldg., Cleveland, Ohio.
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Gateway Center No. 3 Bldg., Pittsburgh, Pa.
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio.
U. S. Steel Corp. (American Steel & Wire Co. Div., Columbia Steel Co. Div., Tennessee Coal Iron & R. R. Co. Div.), 436 7th Ave., Pittsburgh, Pa.

WIRE FORMING MACHINERY
Nilson A. H. Mch. Co., 1506 Railroad Ave., Bridgeport, Conn.
U. S. Tool Co., Inc., 255 North 18th St., Ampere, N. J.

WIRE NAIL MACHINERY
Bliss, E. W., Co., 1375 Raff Rd., S. W., Canton, Ohio.
National Mchry. Co., Greenfield and Stanton Sts., Tiffin, Ohio.
Ryerson, Jos. T., & Son, Inc., 2558 W. 16th St., Chicago 18, Ill.

WOODWORKING MACHINERY
Delta Power Tool Div., Rockwell Mfg. Co., 614G N. Lexington Ave., Pittsburgh 8, Pa.
Frew Machine Co., 121 East Luray St., Philadelphia 20, Pa.
Greenlee Bros. & Co., 12th and Columbia Aves., Rockford, Ill.
Onsrud Machine Works, Inc., 3940 Palmer St., Chicago, Ill.
Walker-Turner Div., Kearney & Trecker Corp., 900 North Ave., Plainfield, N. J.

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Cone-Drive Gear Div., Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.
Link-Belt Co., 2045 W. Huntington Park Ave., Philadelphia 40, Pa.
Ohio Gear Co., 1333 E. 179th St., Cleveland, Ohio.
Philadelphia Gear Works, Erie Ave. and G St., Philadelphia, Pa.

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Armstrong Bros. Tool Co., 5200 W. Armstrong Ave., Chicago, Ill.
Cleco Div., Reed Roller Bit Co. (Impact, Pneumatic), 5125 Clinton Ave., Houston 20, Tex.
Ingersoll-Rand Co. (Impact, Pneumatic, Electric), Phillipsburg, N. J.
Standard Tool Co., 3950 Chester Ave., Cleveland, Ohio.

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Peck, Stowe & Wilcox Co., Southington, Conn.

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Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mch. Co., New Bedford, Mass.
Pratt & Whitney, West Hartford, Conn.
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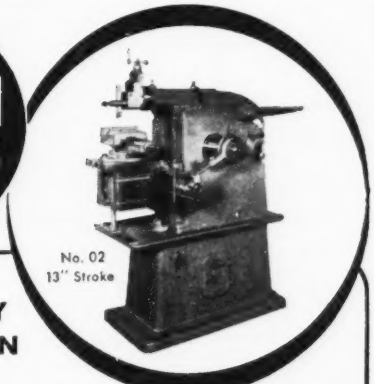
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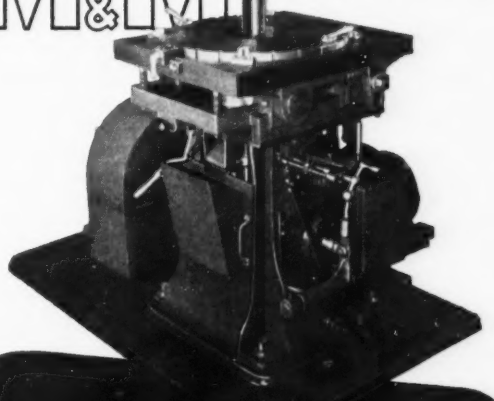
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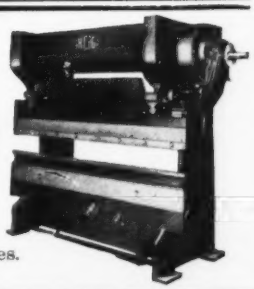
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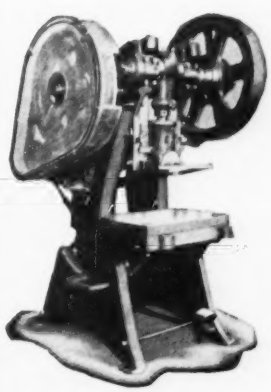
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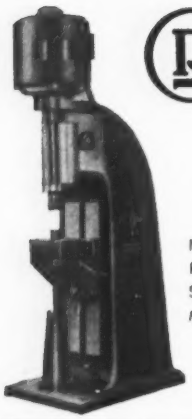
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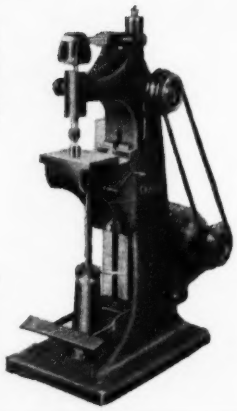
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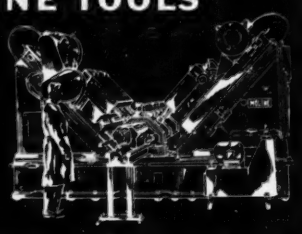
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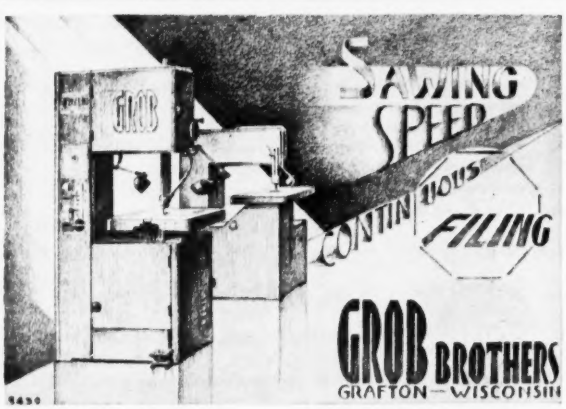
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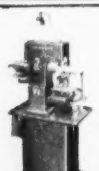
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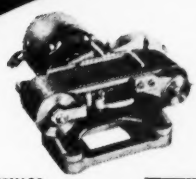
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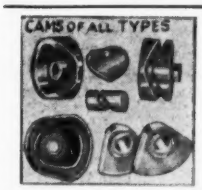


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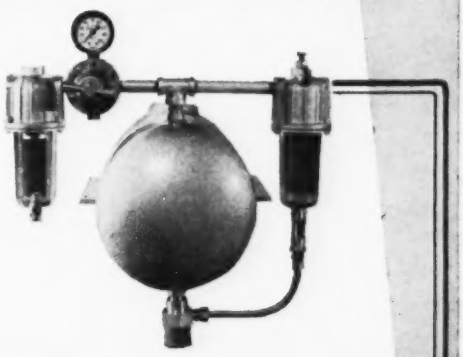
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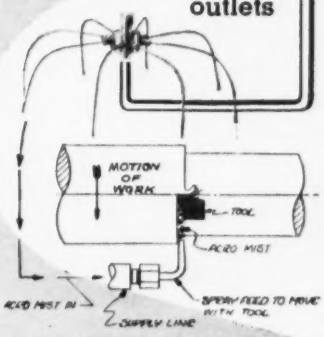
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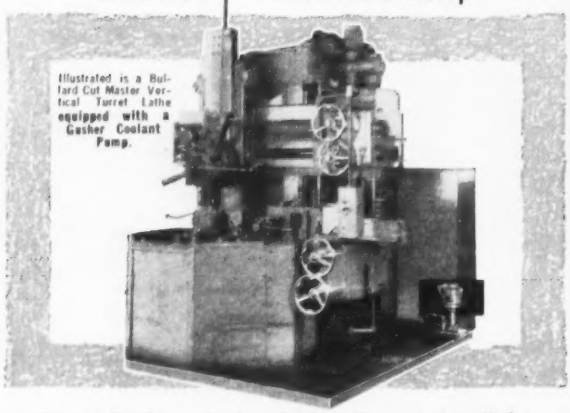
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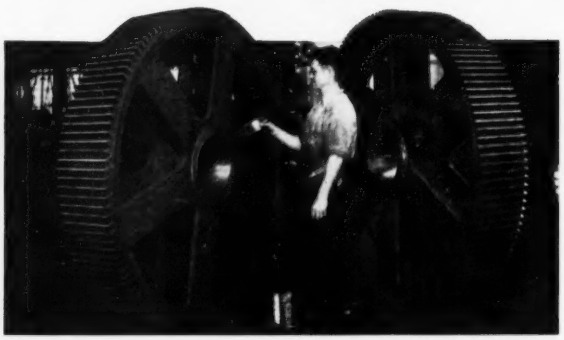
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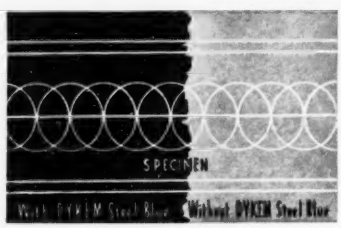
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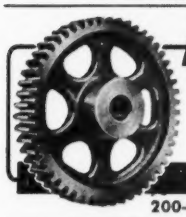
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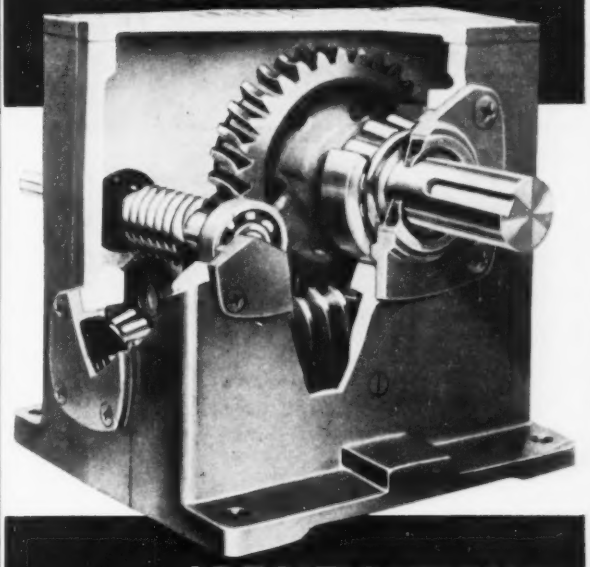
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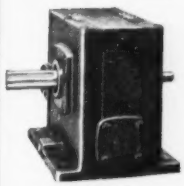
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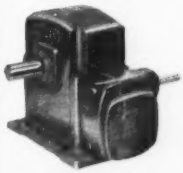
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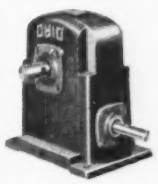
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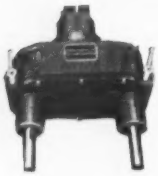
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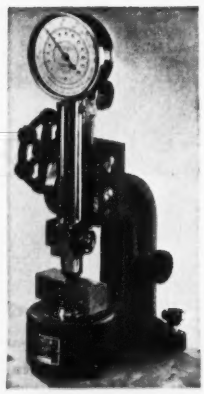
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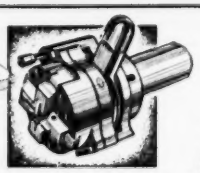
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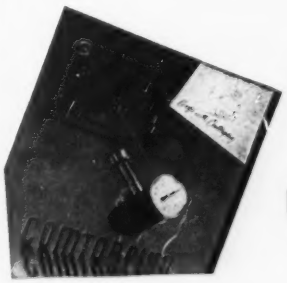
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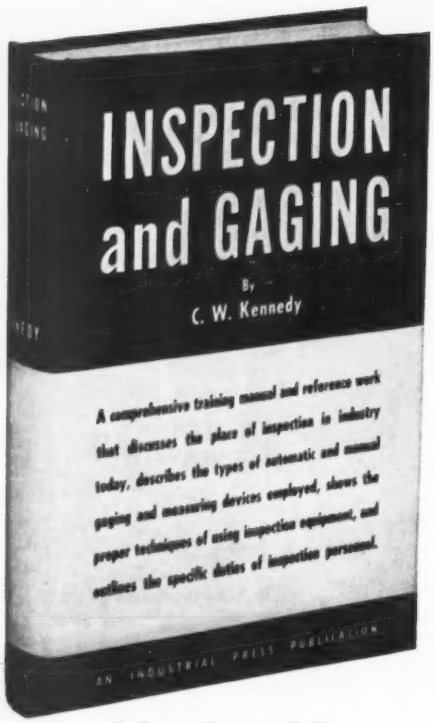


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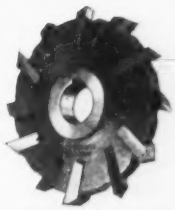
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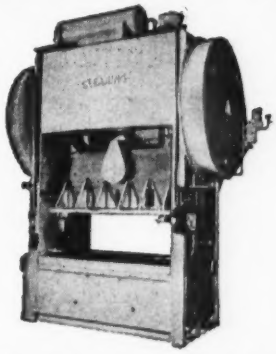
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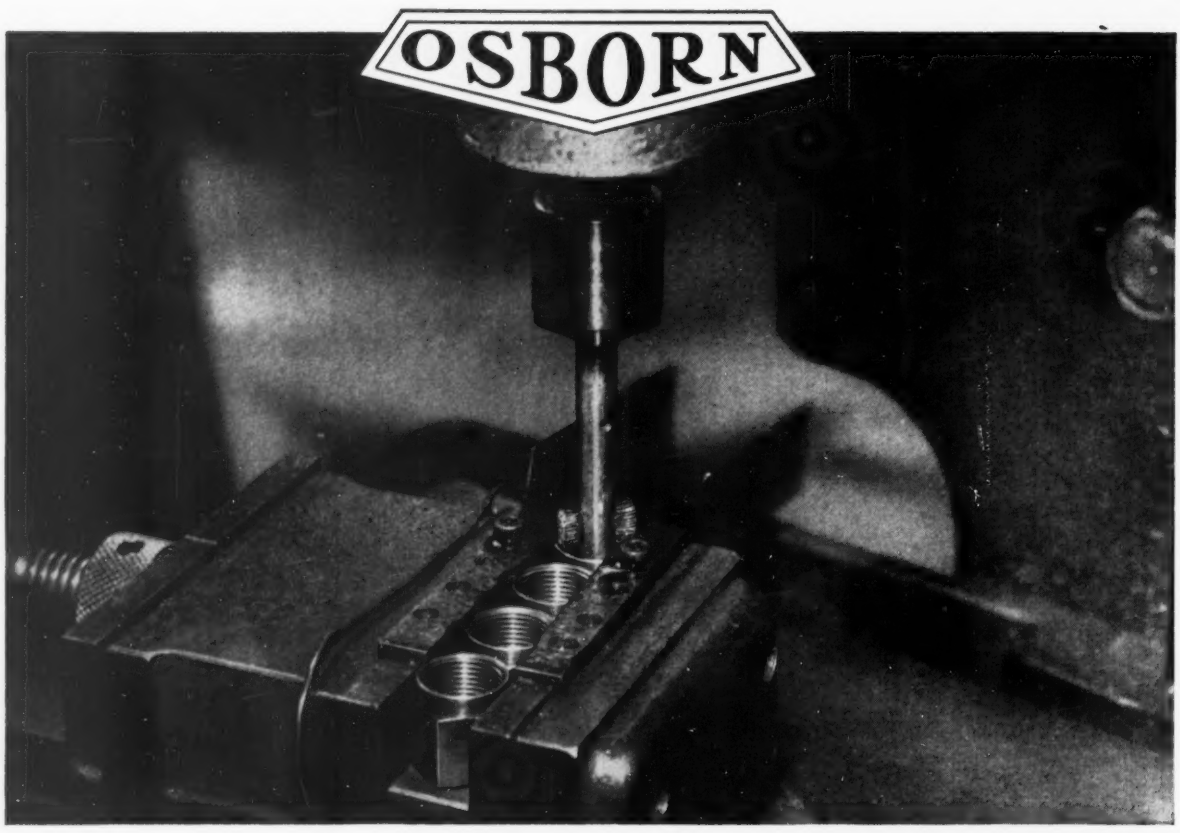
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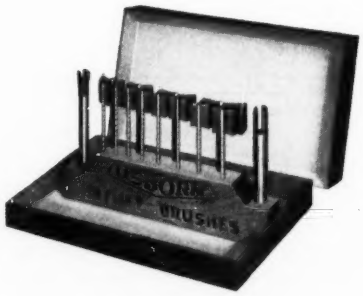
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Illustration shows a new aluminum slitting line in the Birmingham, Ala., plant of Southern States Iron Roofing Company. **WORM GEARING**—universal in its application—affords advantages for almost every power transmission job. Select worm gear drives to meet your needs from the Cleveland line.

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Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.



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Speed Reducers

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with help of TIMKEN® bearings

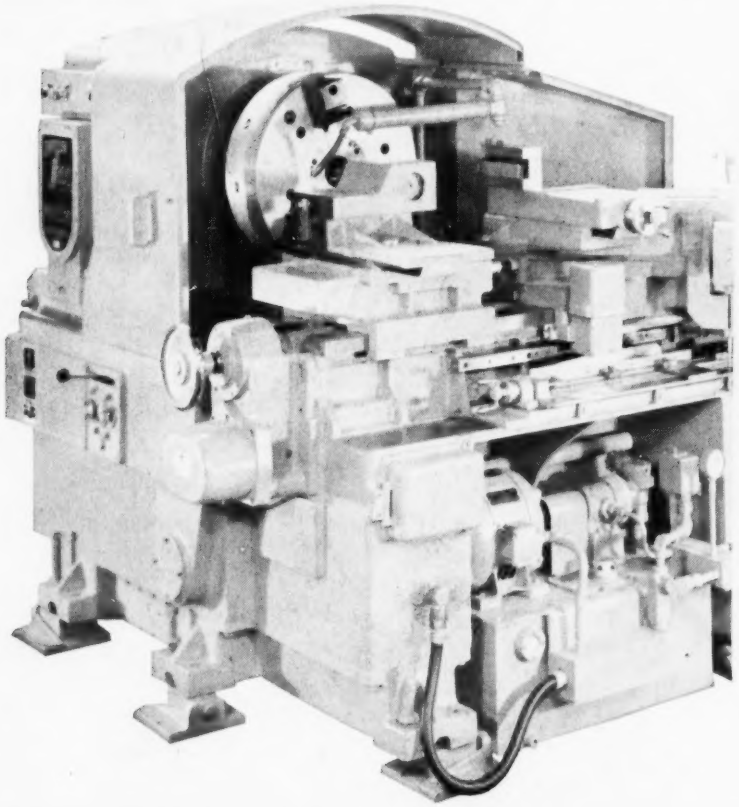
SPEED, precision and automatic operation—these are the machining qualities built into Lodge & Shipley's new 30″ T-Matic. With the bed at right angles to the spindle, it face contours, bores, turns big parts with small-lathe accuracy.

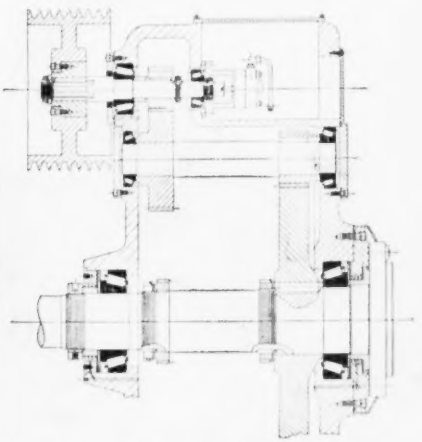
Since all the T-Lathe's work is single chucked, the spindle must be completely free of end play. Otherwise face contouring accuracy would be affected. Any wobble or chatter in the spindle would be doubled or tripled near the outside of large diameter parts.

For these reasons, Lodge & Shipley mounted the spindle on 2 Timken® bearings. Their tapered rollers are preloaded during assembly, eliminating both end and side play. Since the spindle must support large work pieces, these are large diameter bearings. Yet their run-out never exceeds three tenthousandths of an inch (.0003″).

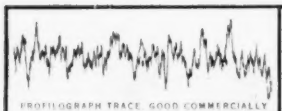
Made of the Timken Company's own fine alloy steel, Timken bearings normally last the life of the machine tool they're a part of. Building or buying machines, specify "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED — *This symbol on a product means its bearings are the best.*

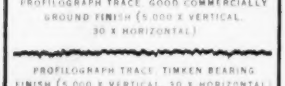




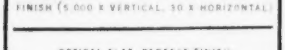
How **THE LODGE & SHIPLEY COMPANY** mounts T-Lathe spindle on Timken bearings to get accuracy needed for delicate work on large diameter pieces.



PROFILOGRAPH TRACE, GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)



PROFILOGRAPH TRACE, TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)



OPTICAL FLAT, PERFECT FINISH

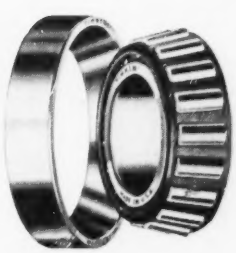
SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◫ AND THRUST →◫← LOADS OR ANY COMBINATION →✳←